GRB

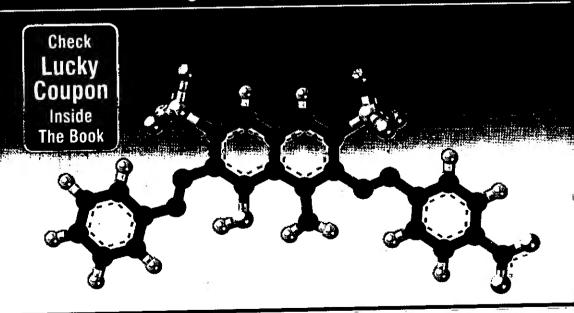
Himanshu Pandey

A TO STATE OF THE

GRB ADVANCED PROBLEMS IN

ORGANIG CHEMISIRY

For **JEE** (Main & Advanced) & All Other Engineering Entrance Examinations





Ō	Distribution	Office	
---	--------------	--------	--

G. R. BATHLA PUBLICATIONS PVT. LTD.

(An ISO 9001 : 2008 Certified Establishment)._

EDUCATIONAL PUBLISHERS & DISTRIBUTORS

"Prakash Building", Opp. Nayyar Palace,

Lal Kurti, Meerut (U.P.)

Phones: (0121) 2640303, 2640304, 2660802, 2660709

: 9760235126 (Enquiry Dept.) : (0121) 6452119, 9219404340, 9267164022 (Sales Dept.)

: (0121) 6452010, 6452126, 9219515310 (Order-Booking Dept.)

: 9760327805, 9897275667 (Customer Care Dept.) : (0121) 2649956, 4059720, 2664539, 4031412

e-mail: www.bathlabooks.com website : grbathla@rediffmail.com

© Author

ISBN: 978-93-82314-46-2

G First Edition : 2010

☐ Sixth Edition: 2014

□ Price: ₹ 452.80

Printed at: Aryan Press. Meerut (U.P.)

No part of this book may be reproduced in any form or by any means without the prior written permission of the author and the publisher.

The author and the publisher have made every effort to provide authentic, accurate and up-to-date information in this book. However, they do not take any legal responsibility for any misinterpretations or errors inadvertently overlooked.

PREFACE to the Sixth Edition =

An excellent response to previous edition, I feel great pleasure in presenting fully revised edition of the book "GRB Advanced Problems in Organic Chemistry for JEE" according to latest pattern of examination.

This book deals with objective problems of each chapter which include Single Choice, Multiple Choice, Matching Type, Comprehension Type and Integer Type Problems. Exercise-1 in every chapter contains two levels, Level-1 is for JEE-Main and Level-2 is for JEE-Advanced. "This book is highly desirable that students, particularly those who work very much on their own, should have a mean of achieving confidence in organic chemistry".

The study of Organic Chemistry requires at least three processes: Learning, Understanding and Application. A very good way of achieving it, is through solving the problems.

I do hope that the new revised edition of the book will be more useful to the students and learned teachers. Suggestions for further improvement of the book will be gratefully acknowledged.

I wish to acknowledge my indebtedness to all the faculties across the India for their enthusiastic support and their useful suggestions given from time to time for improvement of this book.

I would like to thanks Mr. Manoj Kumar Bathla and Mr. Vishvnath Bathla, Directors of G. R. Bathla Publications Pvt. Ltd. for their effort in bringing out this edition.

February, 2014

Himanshu Pandey

Note: Students and honourable teachers may feel free to give valuable suggestions on the mail suggestionsgrb@gmail.com to improve the quality of book.

PREFACE to the First Edition

"New Pattern Advanced Problems in Organic Chemistry for IIT-JEE" has primarily been written with the aim of meeting the needs and interests of student seeking admission to professional courses especially in engineering and medical.

The present book on organic chemistry is designed especially in accordance with the new examination pattern and syllabus of IIT-JEE. The main objective of preparing this book is to keep pace with the changing trends of entrance examinations. To make the students more familiar with trends and tricks, how to solve problems, the present problems book has been prepared. The other salient features of the problems book are summarized below.

- * The problems are based on basic concepts, preparations, properties, structures and usefulness of organic chemistry.
- * Due considerations have been given to mechanism and stereochemical aspects of chemical reactions.
- * Maximum problems in this book are designed by combining two or more concepts. Answering them need thinking and deep knowledge.

I wish to acknowledge my indebtedness to Mr. Amresh Sharma, Mr. Amit Mishra and Mr. Vivek Pathak for their enthusiastic support.

I acknowledge the blessings and support of my mother Smt. Kalindee Pandey, father Dr. S.N. Pandey, uncle Shri Sudhakar Pandey, brother Sudhanshu, Saurabh and my wife Jaya. They supported me all the time during the preparation of book.

I would like to thank Shri Manoj Kumar Bathla and Shri Vishvnath Bathla, Directors, G. R. Bathla Publications Pvt. Ltd., for their effort in bringing out the book.

The author will be grateful to teachers and students, if they be kind enough to offer criticism and suggestions for its improvements and to point out the inevitable errors which, inspite of all efforts, creep in.

April, 2010

Himanshu Pandey

CONTENTS

Chap	ters		Pages
1.	GE	NERAL ORGANIC CHEMISTRY	1-68
	§	Exercise-1: Only One Correct Answer	
	Ū	Level-1	1
		Level-2	9
	§	Exercise-2: More Than One Correct Answers	46
	§	Exercise-3: Linked Comprehension Type	56
	§	Exercise-4: Matrix Match Type	62
	§	Exercise-5: Integer Answer Type Problems	65
	9	Answers	67
2.	ISC	OMERISM 6	9-129
	§	Exercise-1 : Only One Correct Answer	69
		Level-1	78
		Level-2	86
	c	Level-3 Exercise-2: More Than One Correct Answers	110
	§	Exercise-3: Linked Comprehension Type	119
	§ §	Exercise-4: Matrix Match Type	123
	8	Exercise-5: Integer Answer Type Problems	125
4	D 2	Answers	128
3.	H	YDROCARBONS (ALKANE, ALKENE AND ALKYNE) 13	0-210
		Exercise-1 : Only One Correct Answer	
	§	Level-1	130
		Level-2	137
		Exercise-2: More Than One Correct Answers	182
	§		192
	§	Exercise-3: Linked Comprehension Type	202
	§	Exercise-4: Matrix Match Type	206
	§	Exercise-5: Integer Answer Type Problems	200
	9	Answers	205
4.	Н	ALIDES 21	1-278
		Evereine 1 - Only One Correct Answer	
	§	Exercise-1: Only One Correct Answer Level-1	21
		Level-1 Level-2	218
	e	Exercise-2: More Than One Correct Answers	252

	§			263
	§	Exercise-4: Matrix Match Type		270
	§	Exercise-5: Integer Answer Type Problems		274
	2	Answers .		277
5	. А	LCOHOLS AND ETHERS	07	9-344
			41	5-544
	§	Exercise-1: Only One Correct Answer Level-1		
		Level-2		279
	§			289
	§			318
	§	Exercise-4: Matrix Match Type		329
	§	Exercise-5: Integer Answer Type Problems		337 340
	Š			343
			730	
6.	C	ARBONYL COMPOUNDS	34	5-425
	§	Exercise-1: Only One Correct Answer		
		Level-1		345
		Level-2		354
	§	Exercise-2: More Than One Correct Answers		394
	§	Exercise-3: Linked Comprehension Type		404
	§	Exercise-4: Matrix Match Type		417
	§	Exercise-5: Integer Answer Type Problems Answers		421
		Allsweis		424
7.	C	ARBOXYLIC ACIDS AND ITS DERIVATIVES	426	-490
	§	Exercise-1 : Only One Correct Answer		
		Level-1		426
		Level-2		433
	§	Exercise-2: More Than One Correct Answers		465
	§	Exercise-3: Linked Comprehension Type		476
	§	Exercise-4: Matrix Match Type		484
	§	Exercise-5: Integer Answer Type Problems		486
	-	Answers		489
8.	Δħ	MINES	401	80.
			491	-534
	§	Exercise-1 : Only One Correct Answer		
		Level-1		491
	2	Level-2		497
	§	Exercise-2: More Than One Correct Answers		518
	§ §	Exercise-4: Matrix Match Type	-	524
	8 §	Exercise-4: Matrix Match Type Exercise-5: Integer Answer Type Problems		530
	2	Answers		532
	_			534

9.	AF	ROMATIC HYDROCARBONS	535-622
7	() con	Exercise-1: Only One Correct Answer Level-1 Level-2 Level-3 Exercise-2: More Than One Correct Answers Exercise-3: Linked Comprehension Type Exercise-4: Matrix Match Type Exercise-5: Integer Answer Type Problems Answers	535 545 553 599 606 615 617 621
10.	В	OMOLECULES	 623-642
	() con con con	Exercise-1: Only One Correct Answer Level-1 Level-2 Exercise-2: More Than One Correct Answers Exercise-3: Linked Comprehension Type Exercise-4: Matrix Match Type Answers	623 626 634 637 640 642
11.	Pi	RACTICAL ORGANIC CHEMISTRY	643-654
-1	() co co co co	Exercise-1: Only One Correct Answer Exercise-2: More Than One Correct Answers Exercise-3: Linked Comprehension Type Exercise-4: Matrix Match Type Answers	643 647 650 651
12	N	OMENCLATURE	 655-670
	000000	Section-I Section-II Section-III Section-IV Hints & Solutions	655 666 662 663



• 1

•

•

·

.

.

.

. *

(P) F-CH2CH2COOH

(R) F — CH_2 — COOH

General Organic Chemistry



EXERGISES ONLY ONE CORRECT ANSWER



١.	which of the follo	wing belongs to +1 g		
	(a) —OH	(b) — OCH ₃	(c) —COOH	(d) — CH_3
2.		wing is the strongest		
	(a) $N^+(CH_3)_3$	$(b) - ^+NH_3$	$(c) - ^{+}S(CH_3)_2$	(d) — F
3.	Among the follow	ing compounds, the	strongest acid is:	
	(a) HC≡CH	$(b) C_6 H_6$	$(c) C_2 H_6$	(d) CH ₃ OH
4.	Carbocations may			
	(a) π - bonds only			
	(b) π - bonds only		rition also	
	(d) $-I$ effect	ylic and benzylic pos	sition also	
=	` '	O the two carbon	ovvgen bonds at	re found to be of equ
Э.	length. What is the		-oxygen oonus at	c tound to oc or equ
		nd is weaker than the	C—O bond.	
		OO has two resonat		
	(c) The electronic	orbitals of carbon at	om are hybridized	
		btained by removel o		
6. Which of the following resonance structures is the major contributor t				
	resonance hybrid	?		
	$CH_3 - CH_2$.—ĈH—ÖMe ⇔	-	
		(1)	(II)	ı
	(a) I	.1	(b) 11	rocononos etmieturas
	(c) Both have equ			t resonance structures
7.		CHCH ₃ is less stable		
	(a) (CH ₃) ₃ C ⁺	(b) CH ₃ CH ₂ CH ₂	(c) $CH_3\overset{+}{C}H_2$	(d) CH ₃ ⁺
8	Arrange in the ord	ler of decreasing pK		

(S) $Br - CH_2 - CH_2 - COOH$

Correct answer is:

(a) Q > S > P > R (b) P > R > S > Q (c) R > Q > P > S (d) S > Q > P > R9. The strongest base is:

(a) $CH_3 - N - CH_3$ (b)

(a)
$$CH_3 - N - CH_3$$
 (b) C' $CH_3 - NH_2$ (c) $C_6H_5 - N - C_6H_5$ (d) $CH_3 - NH - CH_3$ C_6H_5

10. Consider the following species:

$$(A)$$
 $\overset{\Theta}{O}$ (B) CH_3 $\overset{\Theta}{O}$ (C) $\overset{\Theta}{C}$ (D) $\overset{\Theta}{N}$ $\overset{\Theta}{N}$

Arrange these species in their decreasing order of nucleophilicity.

(a)
$$C > D > B > A$$
 (b) $B > A > C > D$

(c)
$$A > B > C > D$$
 (d) $C > A > B > D$

11. Consider the following carbanions:

(I)
$$H_3CO \longrightarrow \ddot{C}H_2$$
 (II) $O_2N \longrightarrow \ddot{C}H_2$

(III)
$$\stackrel{\Theta}{\bigcirc}$$
 $\stackrel{C}{\stackrel{C}{\rightarrow}}$ (IV) H_3C $\stackrel{\Theta}{\stackrel{C}{\rightarrow}}$ $\stackrel{C}{\stackrel{C}{\rightarrow}}$ $\stackrel{C}{\rightarrow}$ $\stackrel{C}{\rightarrow$

Correct decreasing order of stability is:

(a)
$$11 > 111 > 1V > 1$$
 (b) $111 > 1V > 1 > 11$

(c)
$$IV > I > II > III$$
 (d) $I > II > IV$

I II III Arrange the following phenols in increasing order of
$$pKa_1$$
 value.

Arrange the following phenois in increasing order of p_{Aa_1} value. (a) I < II < III (b) III < I < II (c) III < II < I (d) I < III < II

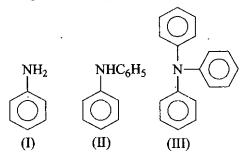
Arrange the following acids in decreasing order of [H⁺] conc.

(a)
$$I > II > III$$
 (b) $II > III > I$ (c) $II > I > III$ (d) $III > II > I$

14. Arrange the following in decreasing order of the pKa value.

 $CH_2 = CHCH_2NH_2, CH_3CH_2CH_2NH_2, CH = CCH_2NH_2$ (c) III > II > I(d) II < III < I(p) II > I > III(a) I > II > III

15. Arrange the following in increasing order of pKa value.

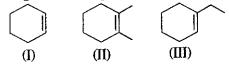


- (a) I < II < III
- (b) III < I < II
- (c) III < II < I
- (d) II < III < I

I > III > II

16. Arrange the following in decreasing order of basicity.

17. Arrange the following in increasing order of stability.



- (a) J < JJ < JJJ
- (b) II < I < III
- (c) I < III < II
- 18. Decreasing order of stability for the following radicals is:

$$CH_2 = \mathring{C}H, \mathring{C}H_2CH = CH_2, \mathring{U}II)$$
 $CH_3 \qquad CH_2 \\ CH_2 \qquad (III)$
 $CH_3 \qquad (III)$

(a) II > III > I > IV

(b) III > II > IV

(c) III < II < I < IV

- (d) I < IV < II < III
- 19. Increasing order of the following stability is:

$$\begin{array}{ccc} \text{CH}_3\text{CH} = \text{CH}_2 & \text{CH}_3\text{CH} = \text{CH}_2 \\ \text{(II)} & \text{(III)} \\ \\ \text{CH}_3 & \text{CHCH} = \text{CH}_2, & \text{(CH}_3)_3\text{CCH} = \text{CH}_2 \\ \text{(III)} & \text{(IV)} \\ \end{array}$$

(a) I > II > III > IV

(b) I > III > II > IV

(c) I > IV > III > II

- (d) IV > III > II > I
- 20. Which of the following molecules can act as a nucleophile and an electrophile?
 - (a) CH₃NH₂
- (b) CH₃Cl
- (c) CH₃CN
- (d) CH₃OH

21.	Which of the following molecules has the shortest carbon-carbon single bon length?				
	(a) $CH_2 = CH - C - CH$	(b) $CH_2 = CH -$	-C≡N		
	$(c) CH_2 = CH - CH = O$	$(d) CH_2 = CH -$	-		
22.	Give the correct order of decreasing ba	sicity of the follow	ing compounds.		
	$C_6H_5NH_2 (C_6H_5)_2NH$	$(C_6H_5)_3N$	$C_6H_{11}NH_2$		
	(I) (II)	(III)	(IV)		
	(a) I > II > III > IV	(b) IV > III > II >			
22	(c) $IV > I > II > III$	(q) III > II > I > I			
25.	The correct order of stability of the fol				
	(a) $CH_3CH_2\overset{+}{C}H_2 > CH_2 = CH - \overset{+}{C}H_2 > CH_2 = CH\overset{+}{C}HCH_3 >$				
			$CH_2 = CHC(CH_3)_2$		
	(b) $CH_2 = CHCH_2 > CH_3CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2CH_2 > CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2$	$CH_2 = CHC(CH_3)$	$_2 > CH_2 = CHCHCH_3$		
	(c) $CH_2 = CH\dot{C}(CH_3)_2 > CH_2 = CH\dot{C}HCH_3 > CH_2 = CH\dot{C}H_2 > CH_3CH_2\dot{C}H$				
	$(d) CH2 = CH - \overset{\dagger}{C}HCH3 > CH2 = C$	CHC(CH ₃) ₂ >CH ₃ C			
			$CH_2 = CHCH_2$		
24.	4. The order of decreasing stability of the following cations is:				
	CH ₃ CHCH ₃ , CH ₃ CHOCH ₃ , CH ₃ CHCOCH ₃				
	(I) (II)	(III)			
	(a) $III > II > I$ (b) $I > II > III$	(c) $II > I > III$	$I \leq III \leq I$		
25.	25. What is the decreasing order of strength of the bases?				
	$(I) OH^ (II) NH_2^-$	$(III) H - C \equiv C$	$(IV) CH_3CH_2^-$		
	(a) $IV > II > III > I$	(b) III > IV > II >			
	(c) $I > II > III > IV$	(q) $II > III > I > I$			
26.	The decreasing order of nucleophilicity		philes is:		
	(I) CH ₃ —C—O ⁻	(II) CH ₃ O			
	Ö		_		
	(III) CN ⁻	(IV) H ₃ C-	O SO ⁻		
	<u> </u>		/ ji , , , , , , , , , , , , , , , , , ,		
	(a) $I > II > III > IV$	(b) IV > III > II >			
7	(c) $II > III > I > IV$	$(q) \prod_{i=1}^{r} > 1 > 1 > 1$	V		
27.	Different hydrogen in		**		
	A B C	D E	r		

 $\mathrm{CH_3CH} \! = \! \mathrm{CH} \! - \! \mathrm{CH_2} \! - \! \mathrm{CH_2} \! - \! \mathrm{CH(CH_3)_2}$

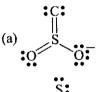
are represented by alphabets. Arrange them in decreasing order of reactivity towards radical substitution.

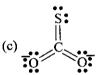
- (a) C > A > E > D > F > B
- (b) F > B > A > C > D > E
- (c) B > C > A > F > D > E
- (d) A > B > C > D > E > F
- 28. Consider the following:

$$CH_3CH_2NH_2, CH_3CNH_2, (II) (III)$$

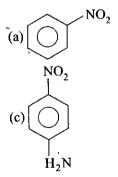
Correct order of their basic strength is:

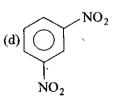
- (a) I < II < III
- (b) II > I > III
- (c) III < II < I
- (d) II < III < I
- 29. The possible structure (s) of monothio-carbonate ion is:



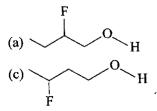


30. In which of the following molecules, π -electron density in ring is minimum?

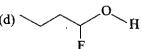




31. In which of the following compounds the hydroxylic proton is most acidic?

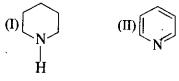


(p)
$$I \stackrel{\cdot}{\checkmark} O \stackrel{H}{\checkmark}$$



32. The correct order of acidity of the following is:

- (a) $III \leq IV \leq I \leq II$
- (c) IV < III < I < II
- 33. In the following compounds,



the order of basicity is:

- (a) IV > I > III > II
- (c) II > I > III > IV
- 34. Consider

The correct order of their acidity is:

- (a) II > I > III > IV
- (c) IV > III > II > I

35. (I)
$$\langle \bigcirc \rangle$$
 $-NH_2$

(III)
$$NO_2$$
— $\langle \bigcup \rangle$ — NH_2

- (b) II > IV < II < I
- (d) None of these

$$(III) \begin{bmatrix} O & & & & \\ & & & & \\ & & & & \\ H & & & H \end{bmatrix}$$

- (b) III > I > IV > II
- (d) I > III > II > IV

- (b) II > III > I > IV
- (d) none of these

(II)
$$CH_3O - \bigcirc NH_2$$

$$(IV)$$
 NO_2 NH_2

The correct order of decreasing basicity of the above compounds is:

- (a) I > II > III > IV
- (c) III > IV > II > I

- (b) II > I > IV > III
- VI < III < I < III (b)
- 36. Select the correct order of basicity.
 - (a) $CH_3CH_2 > CH_2 = CH^- > HC = C^- > OH^-$
 - (b) $CH_3CH_2^- > HC = C^- > CH_2 = CH^- > OH^-$
 - (c) $CH_3CH_2^- > OH^- > HC \equiv C^- > CH_2 = CH^-$
 - (d) $OH^- > HC \stackrel{\cdot}{=} C^- > CH_2 \stackrel{\cdot}{=} CH^- > CH_3CH_2$

37. The acidity of the protons H⁺ in the following is:

- (III) CH₃CH₂OCC<u>H</u>₂COCH₂CH₃
- (a) I > II > III (b) I > III > II
- (c) II > I > III
- (d) III > I > II

38. Which comparison is not correct as indicated?

(d)
$$\sim$$
 COH > CH₃ COH (acidic nature)

39. How many π electrons are there in the following species ? \langle

- (a) 2
- (b) 4
- · (c) 6
- (d) 8

- 40. Which of the following is not correct?
 - (a) A sigma bond is weaker than π bond.
 - (b) A sigma bond is stronger than π bond.
 - (c) A double bond is stronger than a single bond.
 - (d) A double bond is shorter than a single bond.

41. The length of the carbon-carbon single bond of the compounds

- $(II) CH_2 = CH C = CH$
- $(II) CH \equiv C C \equiv CH$

 $(HI) CH_3 - CH = CH_2$

 $(IV)CH_2 = CH - CH = CH_2$

is expected to decrease in the order:

(a) III > II > IV

(b) I > III > II > IV

(c) III > IV > I > II

- (d) II > IV > I > III
- 42. Which of the following involves no displacement or shifting of electrons?
 - (a) Zeeman effect,

- (b) Inductive effect(d) Electromeric effect
- (c) Resonance (d) Electron

 43. Which of the following exhibit electromeric effect?
 - (a) Alkanes

(b) Aldehydes

(c) Alkyl halides

(d) Alkyl amines

- 44. Point out the incorrect statement about resonance.
 - (a) Resonance structure should have equal energy.
 - (b) In resonance structures, the constituent atom should be in the same position.
 - (c) In resonance structure there should be the same number of electron pairs.
 - (d) Resonance structures should differ only in the location of electrons around the constituent atoms.
- 45. Resonating structures of molecules have
 - (a) identical bonding
 - (b) different bonding
 - (c) identical arrangement of atoms and nearly same energies
 - (d) the different number of paired and unpaired electrons
- 46. Shifting of electron of a multiple bond under the influence of a reagent is called:
 - (a) I-effect
- (b) M-effect
- (c) E-effect
- (d) T-effect
- 47. Give the correct order of increasing acidity of the following compounds.

$$(II)$$
 OH $C \equiv CH$

(a) II < I < IV < III

(b) IV < II < I < III

(c) I < II < IV < III

- (d) IV < I < II < III
- 48. Consider the following benzyl alcohol:



Correct order of their K_b value is:

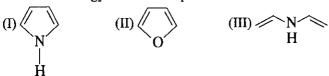
(a) III > IV > II > I

(b) III > I > IV > II

(c) I < II < III < IV

(d) IV > II > I > III

49. Resonance energy of these compounds will be in the order as:



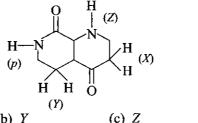
(a) III > I > II

III < II < I (d)

(c) II > III > I (d) II > I > III



1. Which of the indicated H in the following is most acidic?



(b) Y

(d) p

2. In which of the following compounds is hydroxylic proton the most acidic?

(a)
$$\stackrel{F}{\swarrow}O_{H}$$
 (b) $I_{\swarrow}O_{H}$ (c) $\stackrel{}{\swarrow}O_{H}$ (d) $\stackrel{}{\swarrow}O_{H}$

3. Which of the following pairs does not represent the resonance contributors of the same species?

same species?

(a)
$$CH_2$$
— CH

and CH_2 — CH

(b) CH_2
 CH_2

4. Which of the following is not a planar molecule?

(a) $H_2C = C = CH_2$

(b) $H_2C=C=C=CH_2$

(c) $H_2C = C = O$

(d) NC-HC=CH-CN

5. Which of the following pairs does not represent resonance structures?

(a)
$$CH_3 - C = N - O$$
 and $CH_3 - C = N - O$

(a)
$$CH_3$$
— $C \equiv N$ — O and CH_3 — $C = N$ — O
(b) $CH_2 = N$

$$O^{\ominus}$$
and CH_2 — O

(c)
$$CH_2 = \overset{\oplus}{N} = \overset{\ominus}{N}$$
 and $\overset{\ominus}{CH_2} - \overset{\oplus}{N} = N$

(d)
$$C_6H_5$$
— C
 $\overset{\oplus}{\underset{NH_3}{\oplus}}$ and C_6H_5 — C
 $\overset{\oplus}{\underset{NH_2}{\bigcirc}}$

6. In which of the following pairs is the structure on the right major resonance contributor?

7. In which of the following pairs of resonance contributors is the structure on the right a important contributor?

right a important contributor?

(a)
$$H-C=O$$
: \longleftrightarrow $H-C\equiv O$:

(b) $CH_2-N\equiv N$ \longleftrightarrow $CH_2=N=N$

(c) $CH_3-CH-OH$ \longleftrightarrow $CH_3-CH=OH$

(c)
$$CH_3$$
— CH — $OH \longleftrightarrow CH_3$ — CH = OH

- (d) All of the above
- 8. Examine the following resonating structures of formic acid and arrange them in decreasing order of stability:

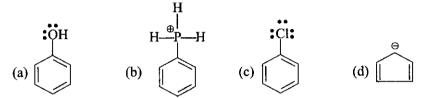
- (a) II > I > III > IV
- (b) I > II > III > IV
- (c) III > II > IV > I
- (d) IV > III > I > II
- 9. Which of the following compounds will not show resonance?

(a) (b)
$$CH_2 = CH - CH = CH - CH_2$$

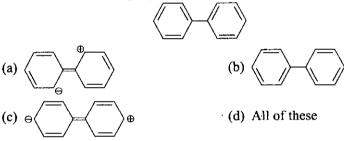




10. Which of the following compounds will exhibit d-orbital resonance?



11. Which of the following represents resonating structure of?



12. Which of the following is not a permissible resonating form?

(a)
$$\overset{\oplus}{CH_2}$$
— $\overset{\ominus}{N}$ — $\overset{\ominus}{O}$
(b) $\overset{\oplus}{CH_2}$ = $\overset{\ominus}{N}$ — $\overset{\ominus}{O}$
(c) $\overset{\ominus}{CH_2}$ = $\overset{\ominus}{N}$ = $\overset{\ominus}{O}$
(d) $\overset{\ominus}{CH_2}$ - $\overset{\ominus}{N}$ = $\overset{\ominus}{O}$
(e) $\overset{\ominus}{CH_3}$
(f) $\overset{\ominus}{CH_3}$
(g) $\overset{\ominus}{CH_3}$
(h) $\overset{\ominus}{CH_2}$ - $\overset{\ominus}{N}$ = $\overset{\ominus}{O}$
(h) $\overset{\ominus}{CH_3}$

13. Less contributing structure of nitroethene is:

(a)
$$CH_2 = CH - N \bigcirc O$$
(b) $CH_2 - CH - N \bigcirc O$
(c) $CH_2 - CH - N \bigcirc O$
(d) $CH_2 - CH - N \bigcirc O$

14. Which will be the least stable resonating structure?

(a)
$$CH_2$$
 = CH — CH — CH — NH_2 (b) CH_2 — CH — CH — CH — NH_2 (c) CH_2 — CH — CH — CH — CH — CH — NH_2 (d) CH_2 — CH — CH — CH — NH_2

15. Which will be the least stable resonating structure?

- 16. Which of the following pairs of structures is not a pair of resonating structures?
 - (a) H— $C \equiv NH$ and H—C = N—H
 - (b) CH₃—CH=CH—CH₃ and CH₃CH₂CH=CH₂

(c)
$$CH_3$$
— C = CH — C — CH_3 and CH_3 — C — CH — C — CH_3
 O
 O
 O

(d)
$$\bigcup_{\bigoplus}$$
 and $\bigcup_{\bigoplus}^{\bigoplus}$

17. Which of the following pairs of structures does not represent resonating structures?

O OH
$$\parallel \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \qquad \mid \qquad \qquad \mid$$

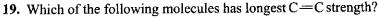
(c)
$$CH_3$$
— C — CH_3 and CH_3 — C — CH_3

(d)
$$CH_2 = C = O$$
 and $CH_2 = C = O$

18. The most stable resonating structure of p-nitrosobenzene is:

$$(a) \begin{picture}(60,0) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0)$$

OH



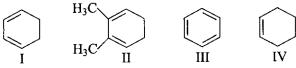
(a)
$$CH_2 = C = CH_2$$

 CH_3
(c) $CH_3 = C = CH = CH_2$

CHa

(b)
$$CH_3$$
— CH = CH_2

20. The decreasing order of bond length of C=C in the following compounds is:



(a) II > I > IV > III

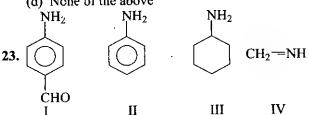
(b) III > II > IV

(c) IV > II > I > III

- (d) IV > I > II > III
- 21. In which of the following molecules all the effects namely inductive, mesomeric and hyperconjugation operate?

22. There are three canonical structures of naphthalene. Examine them and find correct statement among the following:

- (a) All C—C bonds are of same length
- (b) $C_1 C_2$ bond is shorter than $C_2 C_3$ bond
- (c) C_1 — C_2 bond is larger than C_2 — C_3 bond
- (d) None of the above



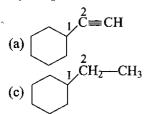
Among these compounds the correct order of C-N bond length is:

(a) IV > I > II > III

(b) III > I > II > IV

(c) III > II > I > IV

- (d) III > I > IV > II
- 24. C₁—C₂ bond is shortest in:



(b)
$$\stackrel{\stackrel{2}{\longrightarrow} CH = CH_2}{\stackrel{1}{\longrightarrow} CH = CH_2}$$

25. Among the following three canonical structures what would be their relative contribution in hybrid?

$$\begin{array}{cccc} \mathrm{CH_2}\!=\!\mathrm{CH}\!-\!\mathrm{CH}\!=\!\mathrm{CH}\!-\!\mathrm{CH}\!-\!\mathrm{CH}\!-\!\mathrm{CH}_2 & \mathrm{II} \\ \mathrm{CH_2}\!=\!\mathrm{CH}\!-\!\mathrm{CH}\!-\!\mathrm{CH}\!-\!\mathrm{CH}\!-\!\mathrm{CH}_2 & \mathrm{II} \end{array}$$

$$\overset{\scriptscriptstyle{\oplus}}{\operatorname{CH}}_{2}$$
— $\overset{\scriptscriptstyle{\ominus}}{\operatorname{CH}}$ — $\overset{\scriptscriptstyle{\ominus}}{\operatorname{CH}}$ — $\overset{\scriptscriptstyle{\ominus}}{\operatorname{CH}}_{2}$

- (a) I > II > III
- (b) II > II > I
- (c) I > III > II
- (d) II > I > II

26.
$$CH_3$$
 $\stackrel{H}{=}$ $\stackrel{H$

C₁—H, C₂—H, C₃—H and C₄—H the homolytic bond dissociation energy is in the order:

- (a) $C_2 H > C_3 H > C_4 H > C_1 H$

- (b) C_1^2 — $H > C_4$ — $H > C_2$ — $H > C_3$ —H(c) C_2 — $H > C_3$ — $H > C_1$ — $H > C_4$ —H(d) C_1 — $H > C_4$ — $H > C_3$ — $H > C_2$ —H
- 27. Which of the following has longest C—O bond?

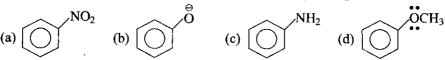








28. In which of the following molecules π -electron density in ring is maximum?



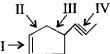
29. The correct stability order of the following resonance structures is:

(a) I > II > IV > III

(b) I > III > II > IV

(c) II > I > III > IV

- (d) III > I > IV > II
- 30. What is correct increasing order of bond lengths of bond indicated as I, II, III and IV in following compounds?



(a) I < II < III < IV(c) IV < II < III < I

- (b) II < III < IV < I
- (d) IV < I < II < III
- 31. Acylium cation has two resonating structures (I) and (II),

$$R - \overset{\oplus}{\mathsf{C}} = \overset{\bullet}{\mathsf{O}} \overset{\bullet}{\cdot} \leftrightarrow R - \overset{\oplus}{\mathsf{C}} = \overset{\oplus}{\mathsf{O}} \overset{\bullet}{\cdot}$$

Which statement is correct for (I) and (II)?

- (a) (I) is more stable than (II)
- (b) Stability of (II) is more than (I)
- (c) Both have same stability
- (d) None of these
- 32. Consider the following three amines,
 - (1) CH₃CH₂—NH₂
- $(2) CH_2 = CH NH_2$
- NH_2

Arrange C-N bond length of these compounds in decreasing order:

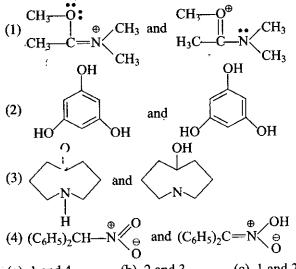
- (a) 1 > 2 > 3
- (b) 1 > 3 > 2
- (c) 3 > 2 > 1
- (d) 2 > 3 > 1

- 33. The C—Cl bond length is shortest in:
 - (a) CH₂--CH---Cl

(b) CH₃—Cl

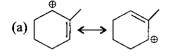
(c) C_6H_5 — CH_2 —Cl

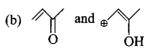
- (d) $CH_2 = CH CH_2 Cl$
- 34. Which of the following pairs of structure are resonance structure?

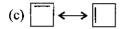


- (a) 1 and 4
- (b) 2 and 3
- (c) 1 and 2
- (d) All of these

35. Which of the following is pair of resonance structure?



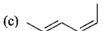




$$(d) \quad \longleftrightarrow \quad \longleftrightarrow \quad \bigoplus$$

36. The most stable diene is:





37. Which of the following cation would have greatest stability?

(a)
$$CH_3$$
 $\xrightarrow{\oplus}$ CH_2 (b) CH_3 $\xrightarrow{\oplus}$ CH_2 (c) CH_3 $\xrightarrow{\oplus}$ CH_2 (d) $:F$ CH_2

38. Which of the following is not valid resonance structure of polyene?

39. Most contributing structure in nitroethene is:

(a)
$$CH_2 = CH - N \bigcirc_{O}^{\oplus}$$

(c)
$$\overset{\ominus}{\text{CH}}_2$$
— $\overset{\oplus}{\text{CH}}$ — $\overset{\oplus}{\text{N}}\overset{\bigcirc}{\overset{\bigcirc}{\text{O}}}$

(d)
$$\overset{\oplus}{CH_2}$$
— $\overset{\oplus}{CH}$ = $\overset{\oplus}{N}\overset{\overset{\bullet}{O}}{\overset{\circ}{O}}$

40. The most stable resonating structure of CH_3 —O—CH=CH is :

(a)
$$CH_3$$
— O — CH — CH_2
 O

(c) CH_3 — O = CH — CH_2

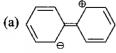
(b)
$$CH_3 \longrightarrow CH \longrightarrow CH_2$$

(c)
$$CH_3 - CH - CH$$

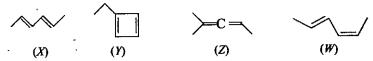
(d)
$$CH_3$$
— O — CH — CH_2

41. Which of the following does not represent resonating structure of?





42. The correct stability order of following species is:



- (a) X > Y > W > Z (b) Y > X > W > Z (c) X > W > Z > Y (d) Z > X > Y > W
- 43. Choose the correct statement:
 - (a) I effect operate in both σ and π bonds
 - (b) I effect create net charge in molecule
 - (c) I effect transfer electron from one carbon to another
 - (d) I effect create partial charges and it is distance dependent
- 44. Which carbocation is most stabilised among following?

45. Which one of the following is most stable?

46. Which of the following cations is most stable?

(a)
$$\bigcirc$$
 (b) \bigcirc (c) \bigcirc (d) \bigcirc (H₃

47. Which of the following cations is most stable?

(a)
$$\begin{array}{c} CH_3 \\ C \\ C \\ C \\ CH_3 \end{array}$$
(b) $\begin{array}{c} CH_3 \\ C \\ C \\ CH_3 \end{array}$
(c) $\begin{array}{c} CH_3 \\ CH_3 \\ CH_3 \\ CH_3 \end{array}$
(d) $\begin{array}{c} CH_3 \\ CH_3 \\ CH_3 \\ CH_3 \end{array}$
(e) $\begin{array}{c} CH_3 \\ CH_3 \\ CH_3 \\ CH_3 \end{array}$

48. Which of the following carbanions is most stable?



49. In which of the following 2nd anion is more stable than first?

(a)
$$O_2N$$
— $\overset{\Theta}{CH}_2$ and F — $\overset{\Theta}{CH}_2$

(c)
$$F_3C$$
— CH_2 and Cl_3C — CH_2

(d)
$$CH_3$$
— C — CH_2 and H_2N — CH_2

50. Arrange the following carbanions in decreasing order of stability:

$$CH_2 = CH$$

$$\begin{array}{ccc} \operatorname{Ph} & & \operatorname{CH}_2 & \operatorname{CH}_2 = \operatorname{CH} & & \operatorname{CH}_2 \\ (Q) & & & (R) \end{array}$$

(a)
$$P > Q > R > S$$

(b)
$$S > Q > P > R$$

(c)
$$S > Q > R > P$$

(d)
$$Q > \overline{S} > R > P$$

51. Arrange the following cations in decreasing order of stability:

$$CH_2 = CH - CH_2$$
 $Ph - CH_2$ $CH_3 - CH_3$ CH_3

$$CH_3 \stackrel{\oplus}{-} CH_3$$

(a)
$$P > R > Q > S$$
 (b) $R > P > S > Q$ (c) $Q > R > P > S$ (d) $P > Q > S > R$

52. Among the following which is most stabilised cation?

53. Which of the following anions is most stabilised?

(d) All have same stability

54. Arrange the following anions in decreasing order of stability:

$$\begin{array}{ccc}
O & O \\
\parallel & \oplus & \parallel \\
CH_3 - C - CH - C - H \\
(Q)
\end{array}$$

$$CH_3 - C - CH - C - O - CH_3$$

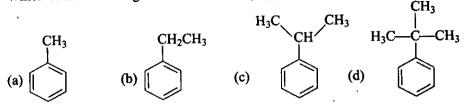
(a)
$$R > Q > P$$

(b)
$$Q > R > P$$

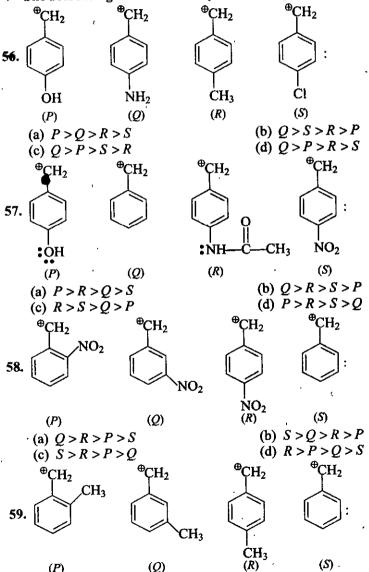
(c)
$$P > R > Q$$

(d)
$$P > Q > R$$

55. Which of the following is most stabilised by hyperconjugation?



⇒ The decreasing order of stability of following cations is (Question No. 56-60).

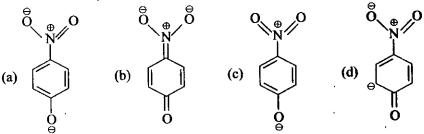


(a) P > Q > R > S (b) P > S > Q > R (c) P > R > Q > S (d) S > R > Q > P

(a) P > Q > R > S (b) S > R > Q > P (c) Q > S > R > P (d) Q > R > S > P

(a) R > S > Q > P (b) P > S > R > Q (c) Q > P > S > R (d) S > R > Q > P

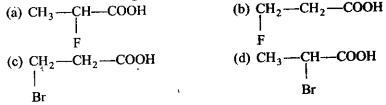
66. The most unlikely representation of resonance structure of p-nitrophenoxide is:



67. Which will be least stable resonating structure?

(a)
$$CH_2 = CH - \overrightarrow{C}H - \overrightarrow{C}$$

68. Which of the following acids has lowest value of dissociation constant?



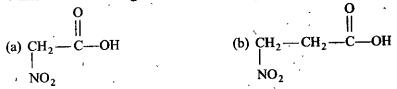
69. Arrange the following acids in decreasing order of acidity:

O

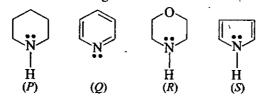
H—C—OH

$$(X)$$
 (X)
 (X)

(c) Z > X > Y (d) Z > Y > Y 70. Which of the following acids has lowest pK_a value?



71. Write the order of basic strength:



(a) Q > R > S > P (b) P > R > Q > S (c) R > P > S > Q (d) P > Q > R > S

72. Write the correct order of acidity:

O COOH COOH
$$H$$
—C—OH $COOH$ CH_2 $COOH$ CH_2 $COOH$ $COOH$ $COOH$ $COOH$ $COOH$ $COOH$ $COOH$ $COOH$

(a) P > Q > R > S (b) Q > P > R > S (c) Q > R > S > P (d) S > R > Q > P

73. Write basicity order of following:

$$\begin{array}{c} \text{NH} & \text{O} \\ \parallel & \parallel \\ \text{CH}_3 - \text{C} - \text{NH}_2; \text{CH}_3 - \text{CH}_2 - \text{NH}_2; (\text{CH}_3)_2 \text{NH}; \text{CH}_3 - \text{C} - \text{NH}_2 \\ (P) & (Q) & (R) & (S) \end{array}$$

(a) P > S > R > Q (b) R > S > Q > P (c) P > R > Q > S (d) Q > S > R > P

74. Among the following compounds the strongest acid is:

(a) HC≡CH

(b) C_6H_6

(c) C_2H_6

(d) CH₃OH

75. Find out correct order of acidity of the following compounds:

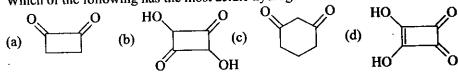
(a) R > Q > P > S (b) P > Q > R > S (c) R > Q > S > P (d) P > S > Q > R

76. Find out strongest acid among the following:

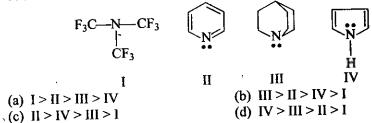
(a) $CH_3 \longrightarrow NH_3$ (b) $C_6H_5 \longrightarrow NH_3$ $\stackrel{\oplus}{}NH_2$

(c) $H_2N - C - NH_2$ (d) $O_2N - C$

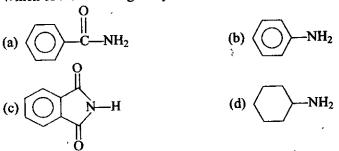
77. Which of the following has the most acidic hydrogen?



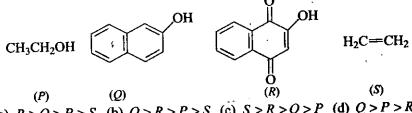
78. The correct order of decreasing basicity of the compounds is:



- 79. Which of the following has most acidic hydrogen?
 - (b) $CH_3 C H$ (c) $H C(NO_2)_3$ (d) Ph_3CH (a) $CH_3 - NO_2$
- 80. Which of the following compounds can react with base to form salt?



81. Arrange the following compounds in decreasing order of acidity:



- (a) R > Q > P > S (b) Q > R > P > S (c) S > R > Q > P (d) Q > P > R > S
- 82. Which one among the following is the least basic?
- (c) $CH_3CH_2NH_2$ (d) (b) NH₃ (a) CH₃NH₂ 83. Which of the following compounds contain most acidic H?
 - (a) $CH_2 = CH_2$ (d) $CH_2 = CH - CH_2 - CH = CH_2$

(b) HC≡CH

84. Which of the following reactions does not proceed in forward direction?

(a)
$$Ph_3C-H+CH_3(CH_2)_3Na \longrightarrow Ph_3CNa+CH_3(CH_2)_2CH_3$$

(b)
$$O_2N$$
 \longrightarrow O_2 O_2N \longrightarrow O_2N \longrightarrow

(c)
$$CH_3 - C - CH_2 - C - CH_3 + C_2H_5 ON a$$

$$O \qquad ONa$$

$$\parallel \qquad \qquad | \qquad \qquad |$$

$$\longrightarrow CH_3 - C - CH = C - CH_3 + C_2H_5OH$$

(d)
$$H_3C$$
 \longrightarrow $OH + NaHCO_3 \longrightarrow H_3C$ \longrightarrow $ONa + CO_2 + H_2O$

85. Which of the following reactions does not proceed in forward direction?

- (a) $CH_3CH_2SH + NaOH \longrightarrow CH_3CH_2SNa + H_2O$
- (b) $CH_3CH_2OH + CH_3MgBr \longrightarrow CH_3CH_2OMgBr + CH_4$
- (c) $CH_3CH_2OH + NaOH \longrightarrow CH_3CH_2ONa + H_2O$
- (d) $CH_3CH_2OH + NaH \longrightarrow CH_3CH_2ONa + H_2$

(a)
$$NH_2$$
 (b) NH_2 (c) NH_2 (d) NH_2 (d) NH_2

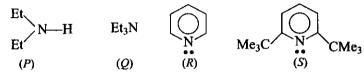
87. Give the correct order of decreasing acidity:

C₂H₅SH C₂H₅OH C₂H₅NH₂ CH₃CH₂CH₃
(a)
$$2 > 1 > 3 > 4$$
 (b) $3 > 2 > 1 > 4$ (c) $1 > 2 > 3 > 4$ (d) $3 > 4 > 2 > 1$

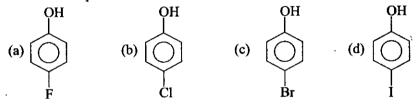
88. Which of the following is the strongest base?



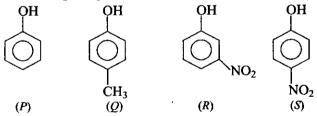
89. Arrange the following compounds in decreasing order of basicity:



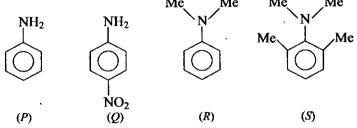
- (a) P > Q > R > S (b) Q > P > R > S (c) R > S > Q > P (d) Q > P > S > R
- 90. Which of the phenol derivative is most acidic?



91. Arrange the following compounds in increasing order of acidity:



- (a) P > Q > R > S (b) S > Q > R > P (c) S > R > P > Q (d) R > S > P > Q
- 92. Arrange the following compounds in increasing order of basicity:



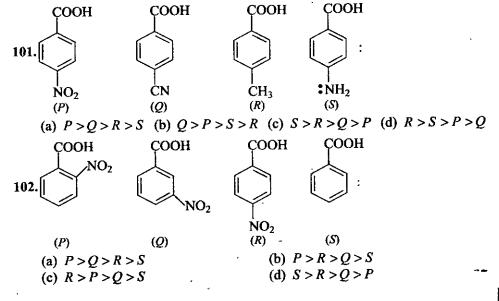
- (a) S > R > Q > P
- (b) S > R > P > Q
- (c) P > Q > R > S
- (d) R > Q > P > S

⇒ The decreasing order of acidity of following phenol derivatives is (Question No. 93-100).

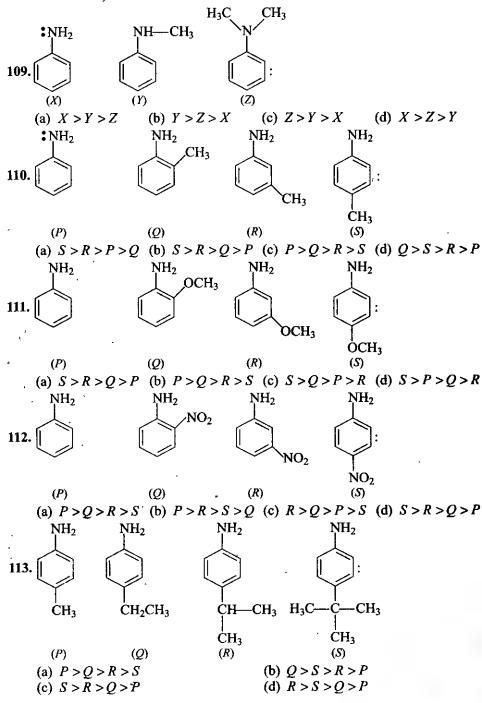
(a) S > Q > P > R (b) S > Q > R > P (c) P > Q > R > S (d) R > S > Q > P

98. OH OH OCH₃ OH OCH₃
$$(P)$$
 (Q) (R) $($

⇒ The decreasing order acidity of following benzoic acid derivatives is (Question No. 101-108).

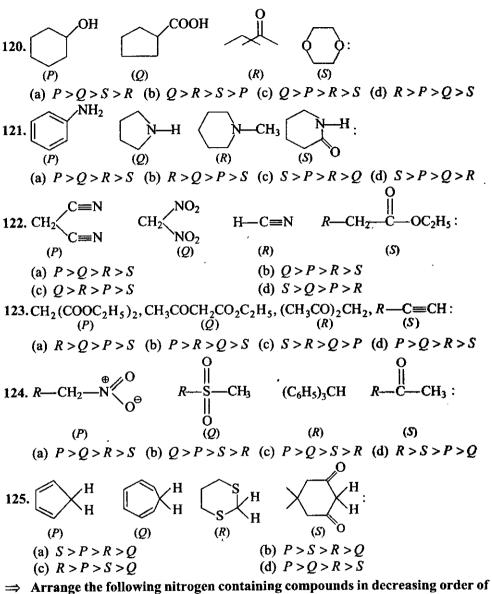


⇒ The decreasing order of basicity of following aniline derivatives is (Question No. 109-117).



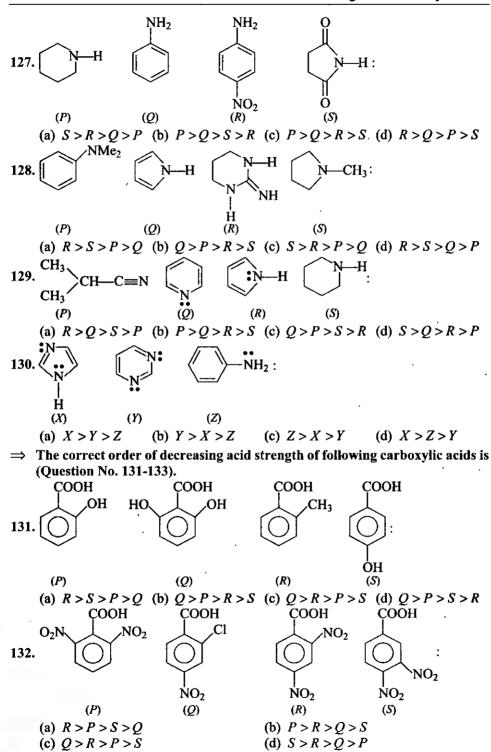
114.
$$(P)$$
 (Q) (R) (R)

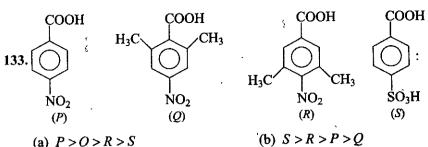
(a) Q > S > P > R (b) P > Q > R > S (c) Q > P > S > R (d) R > Q > S > P



⇒ Arrange the following nitrogen containing compounds in decreasing order of basicity (Question No. 126-130).

126.
$$(P)$$
 (Q) (R) (S) (S) (D) (D)





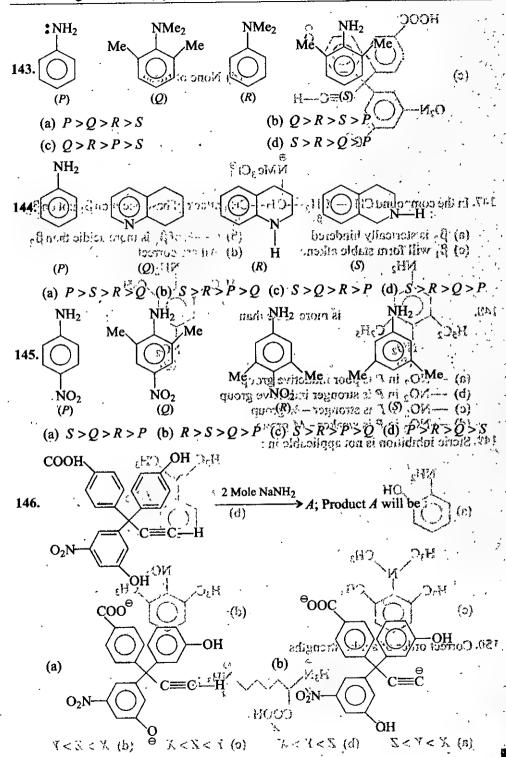
- (a) P > Q > R > S
- (c) S > Q > P > R

- (d) S > R > Q > P

COOH

⇒ Arrange the following compounds in decreasing order of basicity (Question No. 140-145).

140. Me₃C Me_2N MeÖ: Me CO (Q)(R) (S)(a) P > Q > R > S (b) R > S > Q > P (c) P > Q > S > R (d) Q > S > R > P141. Ö Ö (*P*) (Q)(R)(S)(a) Q > R > S > P (b) S > P > Q > R (c) S > P > R > Q (d) P > R > S > QHN NH_2 HN NH_2 HN 142. NH_2 NO_2 (Q)(a) Q > P > S > R (b) R > P > S > Q (c) R > S > P > Q (d) Q > S > P > R



148.

HOOC

(c)

$$O_2N$$
 O_2N

(d) None of these

 O_2N
 O_2N

147. In the compound $CH_3 - CH_2 - CH_3$ attack of base occur on β_1 not on β_2 :

- (a) β₂ is sterically hindered
- (b) C—H of β_1 is more acidic than β_2

 NH_2

- (c) β₁ will form stable alkene NH₂
- (d) All are correct

$$H_5C_2$$
 is more basic than H_5C_2 C_2H_5 NO_2 (Q)

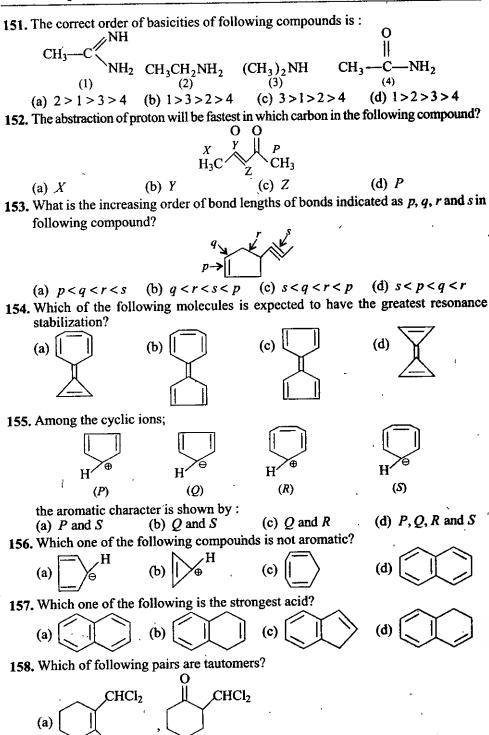
- (a) $--NO_2$ in P is poor inductive group
- (b) $-NO_2$ in P is stronger inductive group
- (c) $-NO_2$ in P is stronger -M group
- (d) $-NO_2$ in P is weaker -M group
- 149. Steric inhibition is not applicable in:

150. Correct order of acidic strengths

$$Z \xrightarrow{\bigoplus_{X} \text{COOH}} NH_3 \text{ is :}$$

- (a) $Y \times Y \times Z$
- (b) Z > Y > X
- (c) Y > Z > X
- (d) X > Z > Y

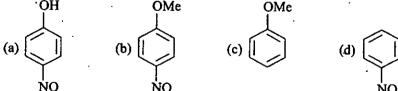
OH



159. The keto isomer of the following compound is:

ÕΗ

.160. Which of the following compounds will exhibit tautomerism?



161. Arrange the following compounds in increasing order of their heat of combustion:

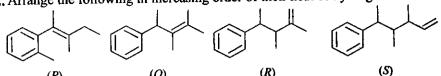
$$(P) \qquad (Q) \qquad (R) \qquad (S) \qquad (T)$$

$$(a) \ P < Q < R < S < T \qquad (b) \ T < S < P < Q < R$$

(c) Q < P < R < T < S

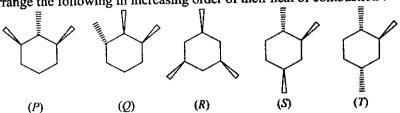
(d) $R < S < T < \tilde{Q} < P$

162. Arrange the following in increasing order of their heat of hydrogenation:



(R)(Q)(a) P < Q < R < S (b) S < R < Q < P (c) S < R < P < Q (d) P < Q < S < R

163. Arrange the following in increasing order of their heat of combustion:



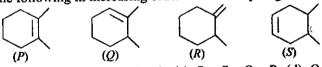
(a) P < Q < R < S < T

(b) S < P < R < Q < T

(c) R < Q < P < S < T

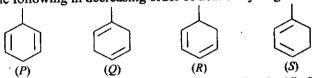
(d) T < S < R < P < Q

164. Arrange the following in increasing order of heat of hydrogenation:

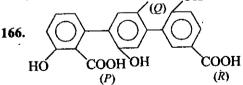


(a) P > Q > R > S (b) Q > P > S > R (c) R > S > Q > P (d) Q > S > R > P

165. Arrange the following in decreasing order of heat of hydrogenation:



(a) P > Q > R > S (b) S > R > Q > P (c) Q > P > S > R (d) R > Q > P > Sсоон он



The correct acidic strength order of acidic hydrogen P, Q and R is respectively:

(a) P > Q > R

(b) P > R > Q

(c) R > Q > P

(d) Q > R > P

NH (Y) (X)The correct basicity order of atoms X, Y and Z is: 167. (Z)

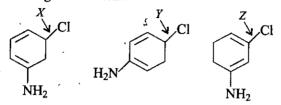
(a) X > Y > Z

(b) Z > Y > X (c) Z > X > Y

168. Which of the following compounds do not have all C—Cbonds of same length?

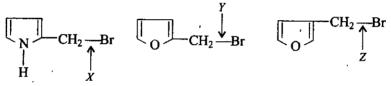


169. Find out correct order for the energy required for heterolytic cleavage of indicated C—Cl bonds forming carbocation :



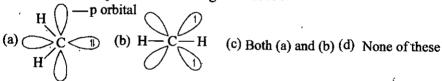
- (a) X > Y > Z
- (b) Z > Y > X
- (c) Z > X > Y
- (d) $\forall Y > X > Z$

170. Find out correct order for the energy required for heterolytic cleavage of indicatedC—Br bonds forming carbocation :

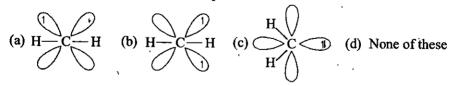


- (a) Z > Y > X
- (b) X > Y > Z
- (c) Y > X > Z
- (d) Z > X > Y

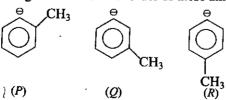
171. Find out correct representation of singlet carbene:



172. Find out correct representation of triplet carbene:



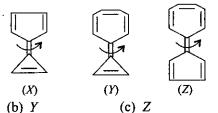
173. Which of the following orders is correct order of these anions?



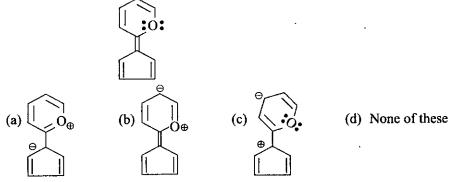
- (a) O > R > P
- (b) Q > P > R
- (c) R > Q > P
- (d) P > Q > R

(a) X

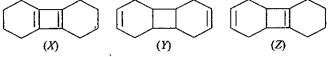
174. The barrier for rotation about indicated bonds will be maximum in which of these compounds?



175. The most stable canonical structure of this molecule is:



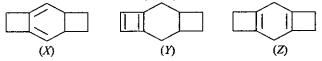
176. Find out stability order of following compounds:



- (a) Z > X > Y
- (b) Z > Y > X
- (c) Y > Z > X
- (d) X > Y > Z

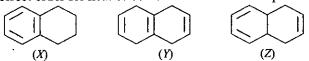
(d) Same in all

177. Find out correct order for heat of hydrogenation of these compounds:



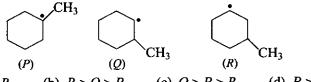
- (a) Y > X > Z
- (b) Y > Z > X
- (c) X > Y > Z
- (d) Z > X > Y

178. Find out correct order for heat of combustion of these compounds:



- (a) X > Y > Z
- (b) Z > Y > X
- (c) Y > Z > X
- (d) Z > X > Y

179. Which of the following orders is correct for hyperconjugation of these radicals?

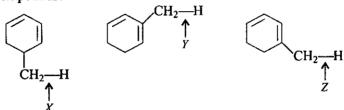


- (a) P > O > R
- (b) R > Q > P
- (c) Q > P > R
- (d) P > R > Q

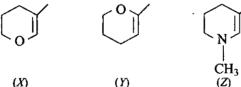
180. Which of the following effects of —NO₂ group operates on —NH₂ group in this molecule?

(a) Only -I effect

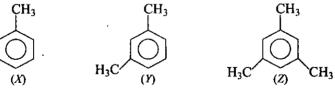
- (b) Only -M effect
- (c) Both -I and -M effect
- (d) Only +M effect
- 181. Which of the following is the correct order for bond energy for C—H bonds in these compounds?



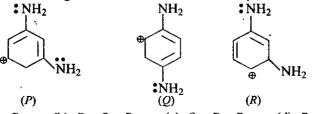
- (a) Y > Z > X
- (b) X > Z > Y
- (c) X > Y > Z
- (d) Z > X > Y
- **182.** Which of the following orders is correct for the magnitude of +M power among these compounds?



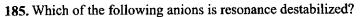
- (a) Z > Y > X
- (b) Y > X > Z
- (c) X > Y > Z
- (d) Z > X > Y
- 183. Which of the following orders is correct for heat of hydrogenation of these compounds?



- (a) X > Y > Z
- (b) Z > Y > X
- (c) Y > Z > X
- (d) Z > X > Y
- 184. Which of the following orders is correct for the stability of these carbocations?



- (a) Q > R > P
- (b) *P > O > I*
- (c) Q > P > R
- (d) R > P > Q





(b) e

(d) []

186.
$$\longrightarrow$$
 X, 'X' will be:

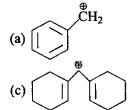


(b) ClO₄

(c) H ClO₄

(d) None of these

187. Hyperconjugation occurs in:

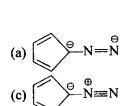


(b) (b)

(d) None of these

188. The most stable resonating structure of the following molecule is:

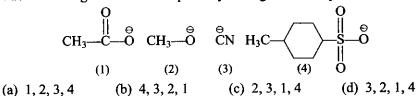
=N=N



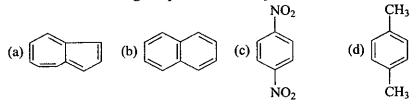
 $(b) \qquad \qquad \bigcirc N = N$

 $(d) = N - \vec{N}$

189. The decreasing order of nucleophilicity among the nucleophile:

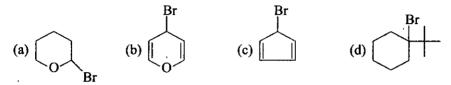


190. Which of the following compounds have a dipole moment?



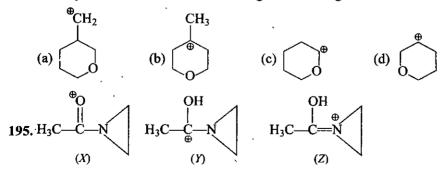
191. Which of the following is the least stable?

192. Among the following which is more reactive toward AgNO₃?



193. Identify the compound which contain most acidic hydrogen:

194. Identify the most stable structure among the following:



The correct stability order of the given canonical structure is:

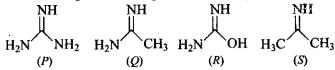
(a)
$$X > Y > Z$$

(b)
$$Z > X > Y$$

(c)
$$X > Z > Y$$

(d)
$$Y > Z > X$$

196. Arrange the following in increasing order of basicity:



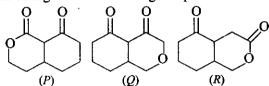
(a) S < Q < R < P

(b) S < Q < P < R

(c) S < R < P < Q

(d) P < Q < R < S

197. Compare acidic strength of the following compound.



(a) P > Q > R

- (b) Q > P > R
- (c) R > P > Q (d) R > P > Q

198. Select the most stable structure among following:









199. Identify the compound which is not aromatic:









200. Find out anti aromatic compound among the following:



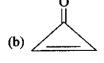






201. Choose the non aromatic compound among the following:

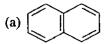








202. Identify the compounds in which all bond length are equal:

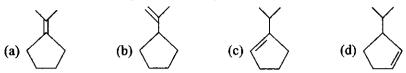




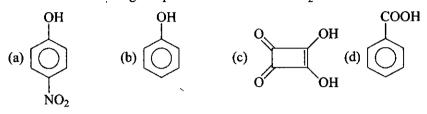




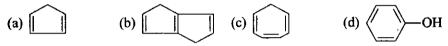
203. Which of the following alkene has highest value of heat of hydrogenation?



204. Which of the following compound will not liberate CO₂ on reaction with NaOH?



205. Which of the following will not react with Na metal?



MORE THAN ONE CORRECT ANSWERS



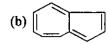
- 1. Which of the following are electrophiles?
 - (a) BF₃
 - (b) CCl₂
- (c) NH₄
- (d) I[⊖]
- 2. Which of the following statements are correct for butadiene?

$$^{4}_{CH_{2}} = ^{3}_{CH} = ^{2}_{CH} = ^{1}_{CH_{2}}$$

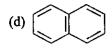
- (a) The C_1 — C_2 and C_3 — C_4 bonds are larger than carbon-carbon double bond (b) The C_1 — C_2 and C_3 — C_4 bonds are shorter than carbon-carbon double bond
- (c) The C₂—C₃ bond is slightly shorter than C—C bond
- (d) The C_2 — C_3 bond is slightly larger than C=C bond
- 3. Br has low reactivity in $CH_2 = CH$ —Br because :
 - (a) the C—Br bond has a partial double bond character
 - (b) of the +M effect of bromine
 - (c) Br is electronegative
 - (d) None of the above
- 4. Which of the following statements are correct?
 - (a) RO^{\ominus} is a stronger nucleophile than $^{\ominus}OH$
 - (b) RCOO[⊕] is a stronger nucleophile than [⊕]OH
 - (c) $RCOO^{\ominus}$ is a stronger nucleophile than ROH
 - (d) RO[⊕] is weaker nucleophile than OH

5. Dipole moment of which compound is not zero?





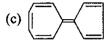


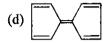


6. Which of following compounds can exhibit free rotation?





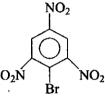




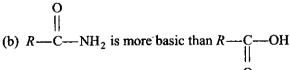
7. In which of following pairs the first one is the stronger base than second?

(c)
$$CH_2 = CH$$
, $HC = C$

8. Which of the statements are incorrect about the following compound?

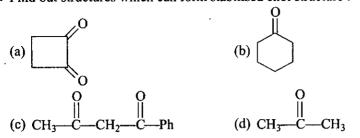


- (a) All three C-N bonds are of same length
- (b) C₁—N and C₃—N bonds are of same length but shorter than C₅—N bond
- (c) C_1 —N and C_5 —N bonds are of same length but longer than C_3 —N bond
- (d) C₁—N and C₃—N bonds are of different length but both are longer than C₅—N bond
- 9. Choose the correct statements:
 - (a) O-hydroxybenzoic acid is much more acidic than m-, p-isomers and benzoic acid itself
 - (b) -M or -R group increases acidity of phenol if they are present at o-and p-position
 - (c) For resonance to take place structure should be planar
 - (d) Resonance involve change in the position of atom
- 10. Which statements among following are correct?
 - (a) Hydration effect stabilise dimethyl ammonium ion more than trimethyl ammonium ion

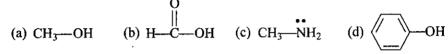


- (c) $CH_3 < NH_2 < OH$ nucleophilicity order in DMSO
- (d) Phenol is more acidic than CH₃OH

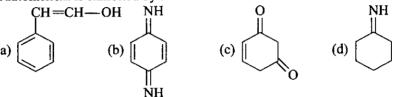
11. Find out structures which can form stabilised enol structure:



12. Which of the following compounds are more acidic than H₂O?



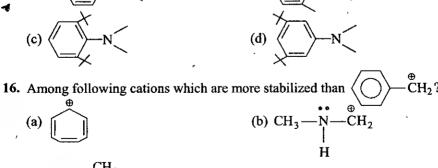
13. Tautomerism is exhibited by:



14. Which of the following compounds would exhibit aromatic properties?

(a)
$$(b)$$
 (c) (c) (d) (d)

15. Which of the following compounds will not show steric inhibition of resonance?



(c)
$$CH_3$$

$$CH_3 - C^{\oplus}$$

$$CH_3 - CH_2$$

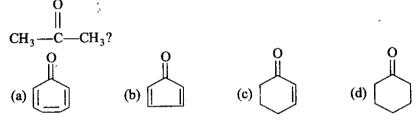
$$CH_3$$

- 17. Among following anions which are more stable than $\langle \bigcirc \rangle$ $\stackrel{\Theta}{CH_2}$?
 - (a) $CH_2 = CH \overset{\Theta}{C}H_2$

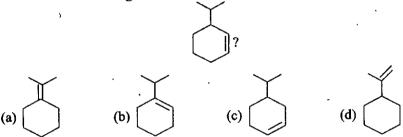
(b) 📥

O || ⊕ (c) CH₃—C—CH₂

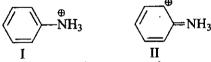
- (d) CH₂
- 18. Which of the following have larger C-O bond length than C-O bond length of



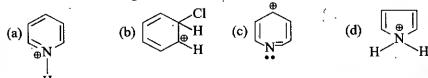
19. Which of the following alkenes are more stable than



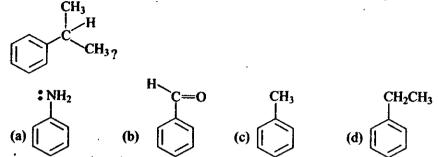
20. Examine the two structures for anilinium ion and choose the correct statement from the ones below:



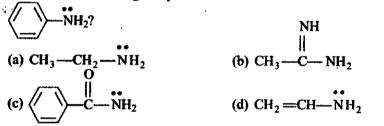
- (a) II is not an acceptable resonating structure because carbocation is less stable than ammonium ion
- (b) It is not acceptable structure because it is non aromatic
- (c) II is not acceptable because N has 10 valence electrons
- (d) II is not acceptable resonating structure
- 21. Which of the following ions will be aromatic in nature?



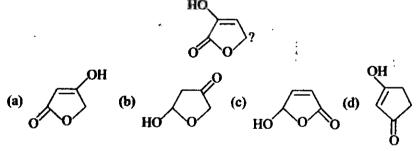
22. Which of the following aromatic rings have greater electron density than



23. Which of the following compounds are more basic than



24. Which of the following compounds contain more acidic hydrogen than hydrogen of

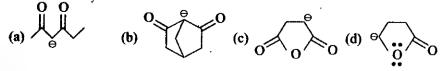


25. Lewis formula for diazomethane, CH₂N₂ is shown below. Find out incorrect structures:

(a)
$$H \longrightarrow C \longrightarrow N = N$$

(b) $H \longrightarrow C \longrightarrow N \longrightarrow H$
(c) $C \longrightarrow N \longrightarrow N$
(d) $H \longrightarrow N \longrightarrow C \longrightarrow N \longrightarrow H$

26. Which of the following carbanions are not resonance stabilized?

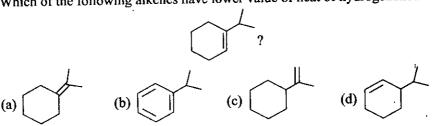


- 27. Which of the following compounds have planar molecular configuration?
 - (a) $H_2C = CH_2$

(b) $H_2C = CH - C = C - H$

(c) $H_2C = C = CH_2$

- (d) $H_2C = C = CH_2$
- 28. Which of the following alkenes have lower value of heat of hydrogenation than

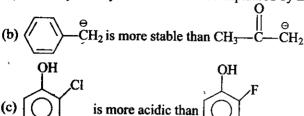


- 29. Which of the following structural pairs do not represent contributors to resonance hybrid?
 - (a) $\stackrel{\Theta}{\bigvee}$ and $\stackrel{\Theta}{\bigvee}$ $\stackrel{\Theta}{\bigcirc}$ $\stackrel{\Theta}{\longrightarrow}$ H
- (b) and

(c) \downarrow and \downarrow

- $(d) \bigvee_{O \longrightarrow H} \text{ and } \bigvee_{O}$
- 30. Which of the following behave both as a nucleophile and an electrophile?
- (a) CH₃ N H₂
 (b) CH₃—Cl
 (c) CH₃—C≡N
 (d) CH₃—31. Polarisation of electrons in acrolein cannot be written as:
 - (a) $CH_2 = CH C = O$
- (b) $\overset{\delta^{-}}{C}H_{2} = CH CH = \overset{\delta^{+}}{O}$
- (c) $\overset{\delta-}{C}H_2 = \overset{\delta+}{C}H CH = 0$
- (d) $\overset{\delta_{+}}{C}H_{2}$ =CH—CH= $\overset{\delta_{-}}{O}$
- 32. Which among the following statements are correct?
 - (a) CF₂ is more stable than CCl₂
 - (b) CCl₂ is more stable than CBr₂
 - (c) Singlet CH₂ is more stable than triplet CH₂
 - (d) Singlet CH₂ has planar geometry
- 33. Which among following statements are correct?
 - (a) Energy needed for homolytic bond fission is less than that required for the heterolytic bond fission
 - (b) Homolytic bond fission gives neutral species which is paramagnetic in nature
 - (c) Homolytic bond fission takes place in non polar solvents
 - (d) Cation and anion is produced by heterolytic bond fission

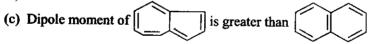
- 34. Which of these statements are correct?
 - (a) Stability of alkyl carbanion can be explained by hyperconjugation



- (d) B.pt. of o-nitrophenol is less than p-nitrophenol
- 35. Which of these statements are correct?

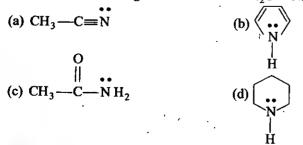


- (b) Acetone behaves as electrophile as well as nucleophile
- (c) CH_3 can show geometrical isomerism
- (d) RO^{Θ} is better nucleophile than RS^{Θ}
- 36. Which of these statements are correct?
 - (a) 1, 3, 5-cycloheptatriene is not acidic while 1, 3-cyclopentadiene is acidic in nature
 - (b) p-chlorophenol is less acidic than p-fluorophenol

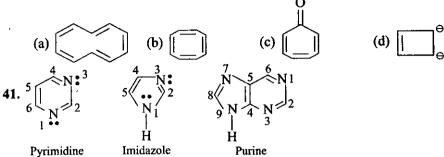


- (d) Mesomeric effect is temporary effect
- 37. Which of the following are nucleophiles?
 - (a) CN^{\theta}
- (b) BF₃
- (c) R—O—I
- (d) NH:

- 38. Which of the following are electrophiles?
 - (a) BF₃
- (b) AlCl₃
- (c) H₂ O
- (d) R₄ N
- 39. Which of the following are less basic than $H_2C = NH$?

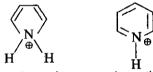


40. Which of the following compounds are not linear?



Among the following which statements are correct?

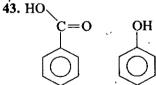
- (a) Both N of pyrimidine are of same basic strength
- (b) In imidazole, protonation takes place on N-3
- (c) Purine has 3 basic N
- (d) Purine, Imidazole and pyrimidine all are aromatic
- 42. Pyridine is more basic than pyrrole. Which of these following statements explain this fact?
 - (a) In pyrrole lone pair is involved in aromaticity, in pyridine lone pair is not involved in aromaticity it is free for donation
 - (b) Conjugated acid of pyridine remains aromatic but pyrrole does not remain aromatic.



Non Aromatic

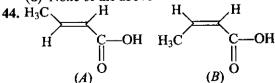
Aromatic

- (c) +I power in pyrrole is greater than pyridine
- (d) +M power of pyrrole is greater than pyridine



Among the following which statements are correct?

- (a) Conjugate base of (I) is more stable than that of phenol (II)
- (b) Conjugate base of (II) is more stable than that of benzoic acid (I)
- (c) Magnitude of positive charge on H atom of —OH group is greater in (l) than (II).
- (d) None of the above

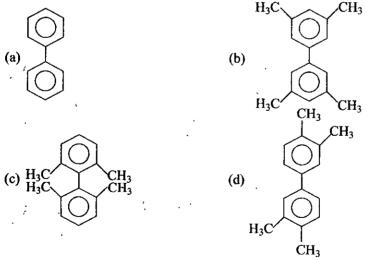


Which of the following statements are correct about this pair of geometrical isomer?



- (a) -I effect of vinylic group on the —COOH group is same in both isomers, so there is no role of -I on the strength of acidity
- (b) +M power of vinylic group is operating effectively in *trans* isomer (A) but not in *cis*-isomer (B) because of steric repulsion in *cis*-isomer causing loss of coplanarity of —COOH gp. with C=C bond. Therefore, *cis*-isomer is more acidic than *trans*
- (c) +I power of CH₃ is greater in trans than cis
- (d) None of the above
- 45. In which of the following molecules —NO₂ group is not coplanar with phenyl ring?

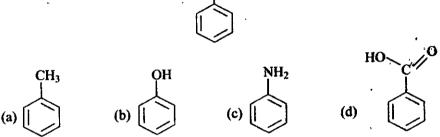
46. In which of the following molecules both phenyl rings are coplanar?



- 47. Find out correct statements regarding resonance energy:
 - (a) It is equal to energy of resonance hybrid.
 - (b) It is equal to the difference in energies of the most stable canonical structure and resonance hybrid
 - (c) It is energy released by the molecule
 - (d) It is equal to the energy of least stable canonical structure

Which of the following statements are incorrect about this molecule?

- (a) $C_1 C_2$ and $C_3 C_4$ bonds are of same length
- (b) $C_1 C_2$ bond is shorter than $C_3 C_4$ bond
- (c) $C_1 C_2$ bond is longer than $C_3 C_4$ bond
- (d) $C_1 C_2$ and $C_2 C_3$ bonds are of same length
- 49. Which of the following compounds will create electron at ortho and para greater than



50. Which of the following compounds have electron deficiency at *ortho* and *para* position?

51. Identify the cations which are less stable than:

$$(a) \qquad \overset{\oplus}{CH_2} \qquad (b) \qquad \overset{\oplus}{CH_2} \qquad (c) \qquad (d) \qquad \overset{\oplus}{CH_2} \qquad (d) \qquad (e) \qquad (e) \qquad (e) \qquad (formula)$$

52. Which of the following alkenes have more value of heat of hydrogenation than

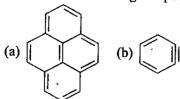


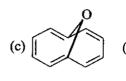






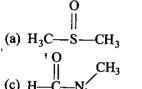
53. Which of the following compounds exhibit aromatic character?



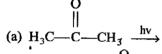


(d)

54. Which of the following solvents are aprotic?



55. In which cases, free radicals can be formed by homolytic fission?



(b)
$$R - N = N - R \xrightarrow{hv}$$

$$\xrightarrow{\text{hv}} \text{ (d) CH}_3 \longrightarrow \text{O} \longrightarrow \text{CH}_3 \xrightarrow{\text{hv}}$$

EXERCISE-3 LINKED COMPREHENSION TYPE



Passage-1

Electron deficient species are known as electrophiles. All positively charged species are not electrophilic. Covalent compounds having complete octet but if central atom has unfilled *d*-orbital also act as electrophiles. All electrophiles are not always lewis acid.

- 1. Which of the following is not electrophile?
 - (a) H[⊕]
- (b) CH₂
- (c) BX₃
- (d) NH₄
- 2. Which of the following electrophile is not lewis acid?
 - (a) BCl₂
- (b) BeCl₂
- (c) CH₃
- (d) CH₂
- 3. Which of the following is electrophilic in nature?
 - (a) CO₂

(b) H₃O [€]

(c) CH₄

(d) AlCl₄

Passage-2

4

When $(C-H)\sigma$ electrons are in conjugation to pi bond, this conjugation is known as hyperconjugation. For any compound to show hyperconjugation:

- (i) Compound should have one sp²-hybridised carbon.
- (ii) α -carbon with respect to sp^2 should be sp^3
- (iii) α-carbon should contain at least one hydrogen atom.

No. of α -carbon ∞ stability of cation and alkene.

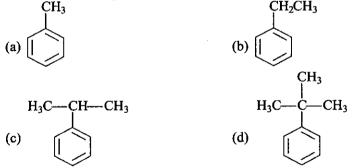
4. Which of following cations is hyperconjugation destabilized?

(a)
$$CH_3$$
— CH_2 (b) CH_3 — CH_3 (c) CH_3 — CH_3 (d) CH_3

5. Which of following alkenes is most stabilized?

(a)
$$CH_2 = CH_2$$
 (b) $CH_3 = CH_2$ (c) $CH_3 = CH_2$ (d) $CH_3 = CH_2 = CH_3$ (d) $CH_3 = CH_2 = CH_3$

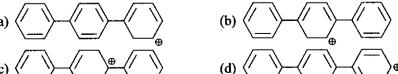
6. Which of following alkyl benzene has maximum electron density?



Passage-3

In an aromatic ring, a functional group with lone pair of electron exerts +M effect, some functional groups like, —NO, —NC —CH=CH₂ etc., can function both as electron donating (+M) or electron withdrawing (-M) groups. More extended conjugation provide more stabilization.

7. The most stable carbocation is:



8. The most stable resonating structure of compound ON N=O

(a)
$$\stackrel{\ominus}{O}=N=\stackrel{\bigoplus}{\longrightarrow}\stackrel{\ominus}{\longrightarrow}\stackrel{\ominus}{\longrightarrow}N=O$$
 (b) $\stackrel{\ominus}{O}=N=\stackrel{\bigoplus}{\longrightarrow}\stackrel{\ominus}{\longrightarrow}N=O$ (c) $O=\stackrel{\oplus}{N}=\stackrel{\ominus}{\longrightarrow}\stackrel{\ominus}{\longrightarrow}N=O$ (d) $\stackrel{\ominus}{O}=N=\stackrel{\bigoplus}{\longrightarrow}\stackrel{\ominus}{\longrightarrow}N=O$

9. The most stable resonating structure is:

$$(a) \qquad (b) \qquad (c) \qquad (d) \qquad (d)$$

Passage-4

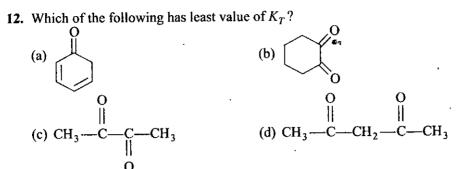
The process whereby a hydrogen atom attached to the α -carbon of carbonyl compound moves to the carbonyl oxygen atom is known as enolization or keto-enol tautomerism. Isomeric carbonyl and enol structure are tautomers.

$$-\frac{H}{C} - C \longrightarrow C \longrightarrow C \longrightarrow C \longrightarrow C \longrightarrow K_T = \frac{[\text{enol}]}{[\text{carbonyl}]}$$
Carbonyl Enol

Normally, the carbonyl form is favoured but structural factor marked affect K_T .

10. Which of the following compounds will not exhibit enolization?

11. Arrange the following compounds in decreasing order of K_T :



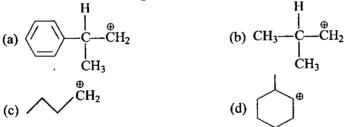
Passage-5

Under common reaction conditions, a carbocation rearranges to another carbocation of equal or greater stability. For example, secondary carbocation will rearrange to a tertiary carbocation. It will not rearrange to a less stable primary carbocation. This generalization is not absolute, and because there is not a high energy barrier to the rearrangement of carbocations, rearrangement to a less stable cation can occur if it offers the chance to form a more stable product.

13. In which of the following cations rearrangement takes place?

(a)
$$(b)$$
 (c) (c) (d) (d) (d)

14. In which of the following cations rearrangement takes place most rapidly?



15. In the following cation, H/CH3 that is most likely to migrate to the positively charged carbon is:

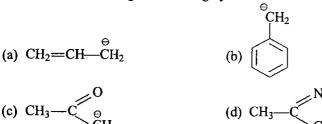
$$H_{3}C^{1} - {}^{2}C - {}^{3}C - {}^{4}C - {}^{5}CH_{3}$$
OH H CH₃

(a) CH₃ at C—4 (b) H at C—4 (c) CH₃ at C—2 (d) H at C—2 age-6

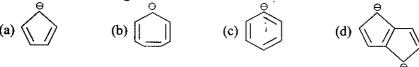
Passage-6

Type of anions in which delocalisation of negative charge occur on more electronegative atom are highly stabilized. If negative charge delocalisation occur on same element then stability is decided by number of resonating structure. Cyclic anions which are aromatic are highly stabilized but if cyclic anions are antiaromatic, they are highly destabilise due to presence of unpaired electrons in antibonding molecular orbital.

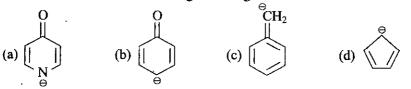
16. Which of the following anions is highly stabilized?



17. Which of the following anions is most destabilized?



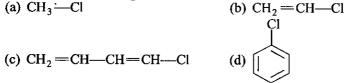
18. Find out most stable anion among following anions:



Passage-7

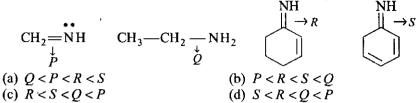
In a substance that are resonance hybrids, the measured length of given bond usually differs from that predicted from any one of the contributing structures. Chloroethylene is found by measurement to have a C—Cl distance of 1.69Å. This is shorter than C—Cl bond in such compounds a methyl chloride (1.77Å), an indication that in chloroethylene the C—Cl bond has some double bond character.

19. Which of the following has shortest C—Cl bond?



20. Arrange the following in decreasing order of C-N bond length:

21. Arrange following in increasing order of C-N bond length:



Passage-8

Basicity is defined by equilibrium constant for abstracting a proton. Nucleophilicity is defined by rate of attack on an electrophilic carbon atom.

Basicity
$$B^{\Theta} + H - A \xrightarrow{Keq} B - H + A^{\Theta}$$

Nucleophilicity $B^{\Theta} + C - X \xrightarrow{K} B - C - + X^{\Theta}$

A species with a negative charge is stronger nucleophile than similar neutral species. Nucleophilicity decreases from left to right in periodic table and increases down the group in periodic table. As the size of similar type of negatively charged species increases, basicity increases and nucleophilicity decreases.

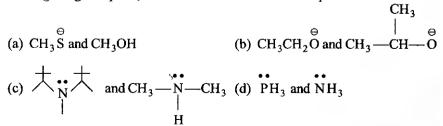
22. Which of the following is incorrect order of nucleophilicity?

(a)
$$\overset{\ominus}{OH} > H_2O$$
 (b) $Et_3 P > Et_2 S$ (c) $I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$ (d) $OH > SH > SeH$

23. Which of the following negatively charged species has maximum basic character?

(a)
$$CH_3\overset{\ominus}{O}$$
 (b) $CH_3\overset{-}{-}C\overset{-}{-}O$ (c) $CH_3\overset{\ominus}{C}CH\overset{\ominus}{O}$ (d) $CH_3\overset{\ominus}{-}O$

24. Among 'he given pairs, in which first has lower nucleophilic character?



Passage 9

Benzoic acid is more acidic than acetic acid, formic acid is more acidic than benzoic acid, among monosubstituted benzoic acid derivative, the *ortho* derivative is more acidic than *meta* and *para* substituted acid due to *ortho* effect. Acidity of an acid can be explained by the stability of conjugated base of acid.

25. Conjugated base of which compound will be most stable?

26. Which one of the following is most acidic?

(a)
$$\bigwedge_{F}^{O}$$
 (b) $\bigwedge_{NO_2}^{O}$ (c) \bigwedge_{Cl}^{O} (d) \bigwedge_{OH}^{O}

27. Compare acidic strength of the following:

(a) R > Q > P

(b) P > Q > R

(c) Q > P > R

(d) $P > \widetilde{R} > Q$

EXERCISE-4 MATRIX MATCH TYPE



- 1. Column (I)
 - (a) H₃C—CH₂
 - (b) H₃C—CH₇
 - (c) Cl—C—Cl
 - $(d) \bigvee_{O} C \bigvee_{O} O$
- 2. Column (I)
 - (a) CH₃—CH—CH₃
 - (b) CH₃

- Column (II)
- P. Resonance
- Q. Hyperconjugation
- R. + I effect
- S. I effect
- Column (II)
- P. Pyramidal structure
- Q. Planar geometry

- (c) CH₃—CH—CH₃
- (d) Singlet carbene
- 3. Column (I)
 - (a) H₃C—CH=CH—C—H
 - (b) D---C-D
 |
 D
 - (c) F—C—F
- 4. Column (I)
 - (a) CO₂
 - (b) NO₂
 - (c) CH₃—C—H
 - (d) H₃C—CH—CH₂
- 5. Column (I)

Compounds

- O O || || || (a) H₃C—C—CH₂—C—OEt
- (c) H—C—CH₂—C—H
- $(d) H C CH_2 N \rightarrow O$

- R. Electrophile
- S. Nucleophile

Column (II)

- P. Resonance
- Q. Hyperconjugation
- R. Inductive effect
- S. Non planar

Column (II)

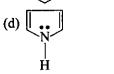
- P. Electrophile
- Q. Ambident nucleophile
- R. Ambident substrate
- S. Electrophile as well as nucleophile

Column (II) pK_a values

- P. 3.5
- Q. 10.7
- R. 8.9
- S. 0.4

6. Column (I)

Compounds



7. Column (I)

- (a) <u>\(\rightarrow</u>
- (b) 💮
- (c)

. Column (I)

(a) NaHCO₃ will react.

CH₃

- (b) Na will react with.
- (c) NaOH will react with.
 - (d) NaNH₂ will react with.

Column (II) pK_b values

P. 13.60

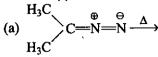
- Q. 6.21
- R. 3.35
- S. 8.80

Column (II)

- P. Hyperconjugation
- Q. All carbon atoms are sp^2 -hybridized
- R. Aromatic
- S. Diamagnetic

Column (II)

9. Column (I)



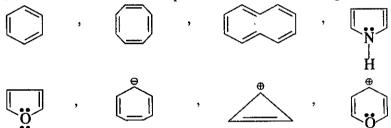
Column (II)

- P. Free radical is formed
- (b) C=O
- Q. N₂ will liberated
- R. Carbene will formed
- S. Nucleophilic aromatic substitution reaction

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS



1. Find out number of aromatic compounds or ion from following.



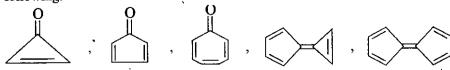
2. The purine hetrocycle occurs mainly in the structure of DNA. Identify number of 'N' atoms having localised lone pair of electron.



3. How many resonating structures are possible for the compound.



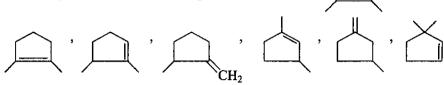
4. Find out number of compounds which are more stabilise in ionic structure, from following.



5. Find out number of benzylic hydrogen in



6. How many alkenes, from followings are more stable than



Find out number of compounds which are more acidic than benzoic acid, from following.

8. Identify number of compound from following. Which liberate CO₂ on reaction with NaHCO₃.

9. How many compounds from following exhibit d-orbital resonance.

$$CI \longrightarrow CI$$
 , $CI \longrightarrow CI$, $CI \longrightarrow CI$

10. Among the following, find out number of ions or molecules that can show backbonding.

(ANS)

 \Diamond

Exercise-1 : Only One Correct Answer

Level-1																~~	
1. (d)	2. (a) 3.	(d)	4.	(c)	5.	(b)	6.	(b)	7.	(a)	8.	(c)	9.	(b)	10.	(a)
11. (a)	12. (a		(a)	14.	(b)	15.	(c)	16.	(d)	17.	(c)	18.	(d)	19.	(a)	20.	(c)
21. (b)	22 . (c		(c)	24.	(c)	25.	(a)	26.	(c)	27.	(a)	28.	(c)	29.	(d)	30.	(d)
31. (d)	32. (t	33.	(d)	34.	(a)	35.	(b)	36.	(a)	37	(d)	38.	(b)	39.	(c)	40.	(a)
41. (c)	42. (a) 43.	(b)	44.	(a)	45.	(c)	46.	(c)	47.	(b)	48.	(b)	49.	(b)		J
Level-2	-													_			
1	7	¥ =			<i>x</i> .	·-····		-		- 1,72							
1. (d)	2. (0	1) 3.	(d)	4.	(a)	5.	(d)		(c)		(d)		(p)		(c)	10.	` '1
11. (d)	12. (:) 13.	(c)	14.		15.	(c)	16.			(a)	18.		19.	: '	20.	
21 . (c)	22. (t	-	(c)	24.		25.		26.			(b)	28.		29.		30.	
31. (b)	32 , (8	•	(a)	34.	- •		(a)	36.	•		(b)	38.		39.		40.	1
41 . (b)	42. ((d)	44.			(b)	46.			(c)	48.				,50.	4
51 . (a)	52. (-	(c)		(d)		(a)	56.			(a)	58.		59.		60	
61. (d)	62. (a	•	. (c)		(b)		(d)	66.			(a)	68.	• •	69.	•		(d)
71. (b)	72. (-	, (c)		(d)		(a)	76.			(d)	78.		79. 89.			(b)
81. (a)	82 (. (c)		(d)		(c)	86.	<u> </u>		(c)	88. , 98.			, ,	100.	
91. (c) 101. (a)	92 (1	-	. (c)		(a)		(d)			_	-						
ill. (d)																	
121. (d)																	
121. (b)																	
141, (d)																	
151. (b)																	
161. (b)																	
171. (a)																	
181. (c)																	
191. (d)																	
201, (c)									\- <i>/</i>		,-/						
Knt* (c)	ZUZ. (u <i>j 203</i>	<u>, (u)</u>	294	(2)	400	(,,					_					

Exercise-2: More Than One Correct Answers

1. (a, b)	2.	(a, c, d)	3.	(a, b)	4.	(a, c)	5.	(a, b)	6.	(b, c)
7. (a, c, d)	8.	(a, b, d)	9.	(a, b, c)	10.	(a, c, d)	11.	(a, c)	12.	(a, b, d)
13. (a, c, d)	14.	(a, b, c)	15.	(a, d)	16.	(a, b, c)	17.	(c, d)	18.	(a, c)
19. (a, b, c, d)	20.	(a, c)	21.	(a, c)	22.	(a, c, d)	23.	(a, b, d)	24.	(a, d)
25. (b, c, d)	26.	(b, d)	27.	(a, b, d)	28.	(a, b)	29.	(b, c, d)	30.	(c, d)
31. (a, b, c)	32.	(a, b, d)	33.	(a, b, d)	34.	(b, c, d)	35.	(a, b)	36.	(a, c)
37. (a, c, d)	38.	(a, b)	39.	(a, b, c)	4C.	(a, b)	41.	(a, b, c, d)	42.	(a, b)
43. (a, c)	44.	(a, b)	45.	(c, d)	46	(a, b, d)	47.	(b, c)	48.	(a, c, d)
49 (a, b, c)	50.	(b, c, d)	5).	(a, b, c)	52.	(b, c)	53.	(a, b, c)	54.	(a, c)
55. (a, b, c, d)										

Exercise 3 : Linked Comprehension Type

1. (d)	2. (c)	3. (a)	4. (d)	5. (c)	€ (a)	7. (a)	8. (d)	9. (c)	10. (c)
11. (b)	12. (c)	13. (d)	14. (a)	15. (d)	16. (c)	17. (b)	18. (a)	19. (d)	20. (c)
21. (b)	22. (d)	23. (b)	24. (c)	25. (c)	26. (b)	27. (a)	•		

Exercise-4: Matrix Match Type

(b) $\rightarrow Q, R$;	$(c) \rightarrow P, S;$	$(d) \rightarrow P, S$
(b) $\rightarrow P$, S;	$(c) \rightarrow Q, R;$	$(d) \rightarrow Q, R$
(b) $\rightarrow R$;	$(c) \rightarrow P, R;$	(d) → S
(b) $\rightarrow Q$;	(c) → S;	$(d) \rightarrow R$
(b) → R;	(c) → S;	$(d) \rightarrow P$
(b) $\rightarrow R$;	(c) → S;	(d) → P
(b) $\rightarrow Q, R, S;$	(c) $\rightarrow Q, R, S$;	$(d) \to P, S$
(b) $\rightarrow P, Q, R, S$;	(c) $\rightarrow P, Q, R, S$;	$(d) \rightarrow P, Q, R, S$
(b) → R;	(c) $\rightarrow P, Q$;	(d) → Q, S
	(b) → P , S ; (b) → R ; (b) → Q ; (b) → R ; (b) → R ; (b) → Q , R , S ; (b) → P , Q , R , S ;	(b) → P, S; (c) → Q, R; (b) → R; (c) → P, R; (b) → Q; (c) → S; (b) → R; (c) → S; (b) → R; (c) → S; (b) → Q, R, S; (c) → Q, R, S; (b) → P, Q, R, S; (c) → P, Q, R, S;

Exercise-5: Integer Answer Type Problems

<u>1. (5) 2. (3)</u>	<u>3. (5)</u>	4. (3)	<u>5.</u> (5)	6. (4)	7. (4)	<u> 3. (5)</u>	9. (4)	<u>10. (5)</u>
----------------------	---------------	--------	---------------	--------	--------	----------------	--------	----------------



lsomerism

CH₃



EXERGISES ONLY ONE CORRECT ANSWER





- 1. Which of the following compounds is optically active?
 - (a) 1-Bromobutane

- (b) 2-Bromobutane
- (c) 1-Bromo-2-methylpropane
- (d) 2-Bromo-2-methylpropane
- 2. Which of the following operations on the Fischer formula $H \longrightarrow OH$ does not C_2H_5

change its absolute configuration?

- (a) Exchanging groups across the horizontal bond
- (b) Exchanging groups across the vertical bond
- (c) Exchanging groups across the horizontal bond and also across the vertical bond
- (d) Exchanging a vertical and horizontal group
- 3. Which of the following compound shows optical isomerism?
 - (a) CH₃CH₂CH₃

(b) СН, ОНСНОНСН, ОН

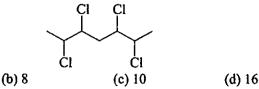
(c) CH₃CHOHC₂H₅

- (d) CCl₂F₂
- 4. Total number of stereoisomers of the compound 2, 4-dichloroheptane are:
 - (a) 2
- (b) 3
- (c) 4
- (d)6
- 5. The structure of (S) 2 chlorobutane is best represented by :

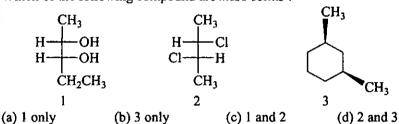
- 6. Which one of the following is chiral?
 - (a) 1, 1-Dibromo-1-chloropropane
- (b) 1, 3-Dibromo-1-chloropropane
- (c) 1, 1-Dibromo-3-chloropropane
- (d) 1, 3-Dibromo-2-chloropropane

(a) 6

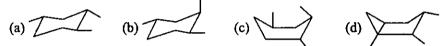
7. What is the maximum number of stereoisomers that could exist for the compound below?



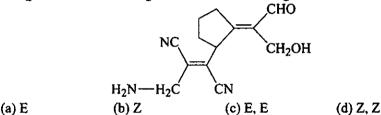
8. Which of the following compound are meso forms?



9. Among the structures shown below, which has the lowest potential energy?



10. Assign double bond configurations to the following:



11. Among the following, the most stable isomer is:



- 12. Which of the following molecules have non-zero dipole moments?
 - (I) Gauche conformation of 1, 2-dibromoethane
 - (II) Anti conformation of 1, 2-dibromoethane
 - (III) Trans-1, 4-dibromocyclohexane
 - (IV) Cis-1, 4-dibromocyclohexane
 - (V) Tetrabromomethane
 - (VI) Dibromocyclohexane
 - (a) I and II (b) I and IV (c) II and IV (d) I, IV and VI

- 13. An aqueous solution containing compounds A and B shows optical activity. A and B are stereoisomers. Which of the following possibilities cannot be correct?
 - (a) A has two centers, but B does not have any because it has a symmetry plane.
 - (b) A and B are enatiomers.
 - (c) A and B are distereomers.
 - (d) A and B are not present in equal amounts.
- 14. How many stereogenic centres does it contain?

(a) 1

(b) 2

(c) 3

(d)4

15. The molecular formula of diphenylmethane,

How many structural isomers are possible when one of the hydrogen in replaced by a chlorine atom?

- (a) 6
- (b) 4
- (c) 8
- (d)7
- 16. Which is the correct structure of D-glyceraldehyde?
 - (a) H-

CH₂OH (c) HO-CHO

(d) All

- 17. Total number of isomers for the molecule, C₃H₆DCl is:
 - (a) 3
- (b) 4
- (c)6

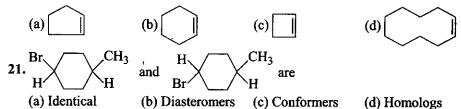
(d) 8

18. Which is the metamer of the compound P?

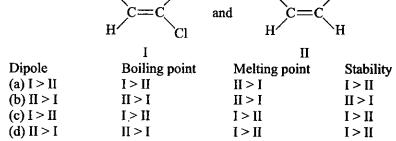
$$(d)$$
 OCH₃CH₃

- 19. If degree of unsaturation is three, then a compound shows:
 - (a) one triple bond and one double bond
 - (b) one double bond and two rings
 - (c) one ring and two double bonds
 - (d) all of these are correct
- 20. Geometrical isomerism is possible in :

 H_3C



22. Which of the following is correct set of physical properties of the geometrical isomers?



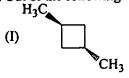
- 23. Which of the following statements is true?
 - (a) A mixture of enantiomers can be separated on the basis of difference in their boiling points (by a method called fractional distillation).
 - (b) A mixture of enantiomers can be separated on the basis of difference in their solubility in any solvent
 - (c) A mixture of enantiomers can be separated by converting them into diastereomers by reacting them with an optically active reagent
 - (d) A mixture of enantiomers can be separated by passing plane polarised through their solution
- 24. Compound H is projection formula of:
 - (a) Cyclohexane
- (b) Cyclopentane
- (c) Cyclobutane
- (d) Cyclopropane
- 25. Which of the following compounds may not exist as enantiomers?
 - (a) CH₃CH(OH)CO₂H

(b) CH₃CH₂CH(CH₃)CH₂OH

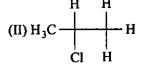
(c) C₆H₅CH₂CH₃

(c) C₆H₅CHClCH₃

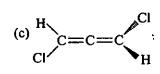
26. Out of the following which are chiral?

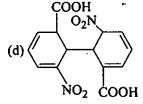


- (a) I, II, III
- (b) I, III, IV
- (c) II, III
- (d) II, III, IV
- 27. Identify number of chiral carbons in the following compounds.



- (a) 1, 2, 1
- (b) 1, 1, 2
- (c) 2, 0, 1
- (d) 2, 1, 1
- 28. Which of the following compounds are optically active?
 - (a) $CH_3 \cdot CHOH \cdot CH_2 \cdot CH_3$
- (b) $H_2C = CH \cdot CH_2 \cdot CH = CH_2$





- 29. Which of the following combinations amongst the four Fischer projections represents the same absolute configurations?

 OH
 - (I) H—OH CH=CH₂

(II) H—CH₃ CH=CH₃

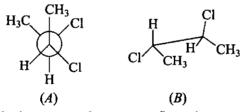
(III) H₃C - HOH

(IV) $HO \xrightarrow{H} CH = CH_2$

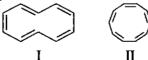
- (a) II and III
- (b) I and III
- (c) II and IV
- (d) III and IV

The compound with the above configuration is called:

- (a) (2S, 3S)-2-chloro-3-hydroxypentane
- (b) (2S, 3R)-2-chloro-3-hydroxypentane
- (c) (2R, 3R)-2-chloro-3-hydroxypentane
- (d) (2R, 3S)-2-chloro-3-hydroxypentane
- 31. Select the correct statements.
 - (a) Eclipsed and staggered ethanes give different products on reaction with chlorine in presence of light.
 - (b) The conformational isomers can be isolated at room temperature.
 - (c) Torsional strain in ethane is minimum at dihedral angles 60°, 180° and 300°.
 - (d) Steric strain is minimum in staggered gauche form of n butane.
- 32. Which of the following statements regarding the projections shown below is true?



- (a) 'A' and 'B' both represent the same configuration
- (b) Both 'A' and 'B' are optically active
- (c) 'B' alone is optically active
- (d) 'A' alone is optically active
- 33. The Newman projection formula of most stable conformation of 3-Hydroxypropanal is gauche. It is stable due to:
 - (a) minimum torsional strain
 - (b) intramolecular hydrogen bonding
 - (c) minimum torsional strain and intramolecular hydrogen bonding
 - (d) minimum steric strain
- 34. The following two compounds are:



- (a) identical
- (c) geometrical isomers

- (b) conformational isomers
- (d) structural isomers

35. Among the following, the optically inactive compound is:

(a)
$$CH_3CH_2$$
 H_3C

(b) H_3C

Ph

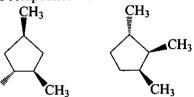
(c) H_3C
 H_3C

Br

(d) H_{400}

HO COOH

36. The following pair of compounds are best described as



- (a) identical
- (c) enantiomers

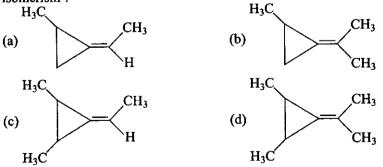
- (b) diastereomers
- (d) none of these
- 37. A natural occurring substance has the constitution shown below. How many isomers may have this constitution?

HO
$$CH_2CI$$

HO $CH=CHCH=CHCH_2CH_2CH_3$

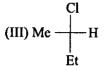
(a) 2 (b) 8 (c) 16 (d) 64

38. Which of the following will not show optical isomerism as well as geometrical isomerism?



39. Which of the following have the same value of optical rotation?





- (a) I, IV
- (b) I, II
- (c) III, IV
- (d) I, III
- 40. The correct decreasing priority of ligands —NO₂, —C≡N, NH₂ and -- CH₂NH₂ in absolute configuration of an enantiomer is:
 - (a) $NO_2 > NH_2 > C = N > CH_2NH_2$
- (b) $NO_2 > C = N > NH_2 > CH_2NH_2$
- (c) $NH_2 > NO_2 > C = N > CH_2NH_2$ (d) $NH_2 > NO_2 > CH_2NH_2 > C = N$
- 41. The two compounds which given below are:

(a) enantiomers

(b) identical

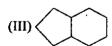
(c) optically inactive

- (d) diastereomers
- 42. The compound which has maximum number of chiral centres is:

43. Identify number of chiral carbons in the following compounds.







- (a) 0, 2, 2, 4
- (b) 2, 2, 0, 4
- (c) 1, 2, 2, 4
- (d) 2, 2, 2, 4
- 44. Which of the following statements is/are correct?
 - (a) A meso compound has chiral centres but exhibits no optical activity
 - (b) A meso compound has no chiral centres and thus are optically inactive



- (c) A meso compound has molecules which are superimposable on their mirror images even though they contain chiral centres.
- (d) A meso compound is optically inactive because the rotation caused by any molecule is cancelled by an equal and opposite rotation caused by another molecule that is the mirror image of the first.
- 45. Which of the following will not show optical isomerism?

(a)
$$CI - CH = C = CH - CI$$

(b)
$$Br - CH = C = CH - Br$$

$$(d) \underbrace{\begin{matrix} Cl \\ Me \end{matrix}}_{Me} \underbrace{\begin{matrix} H \\ H \end{matrix}}_{Cl}$$

46. What is the full name of the following compound?

- (a) (2R,3R)—3—chloro—2—pentanol
- (b) (2R,3S)—3—chloro—2—pentanol
- (c) (2S, 3R)—3—chloro—2—pentanol
- (d) (2S,3S)—3—chloro—2—pentanol
- 47. Which type of symmetry is present in the following molecule?

(a) Plane of symmetry

(b) Centre of symmetry

(c) Both of these

(d) None

48.
$$H_a \xrightarrow{C_2H_5} H_b \xrightarrow{\text{replace } H_a \text{ with D and } H_b \text{ with H}} (X)$$

$$\xrightarrow{\text{replace } H_b \text{ with D and } H_a \text{ with H}} (Y)$$

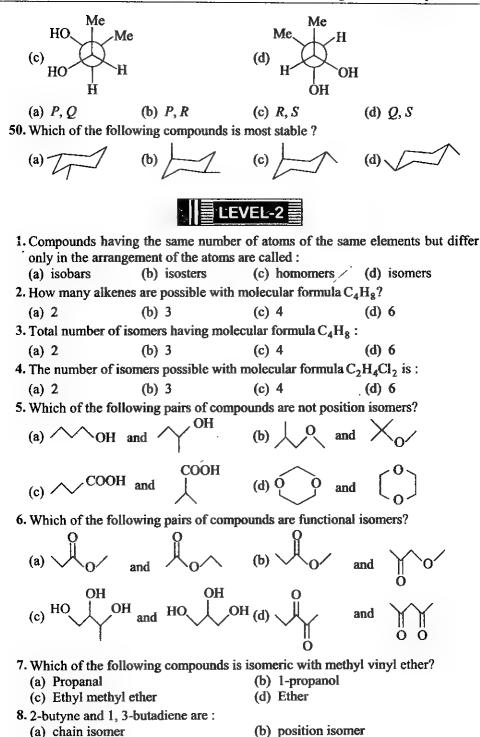
Relation between (X) and (Y) is:

(a) enantiomers

(b) distereomers

(c) E and Z isomer

- (d) constitutional isomer
- 49. Among the following, the Newmann projections of meso-2, 3-butanediol are:

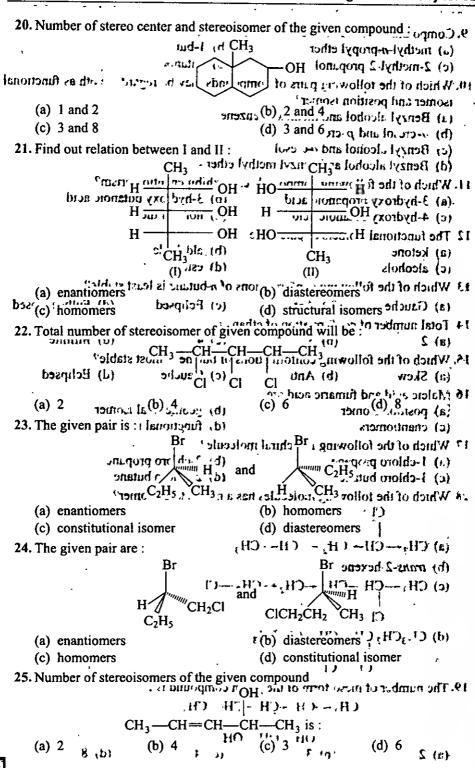


(d) tautomers

(c) functional isomer

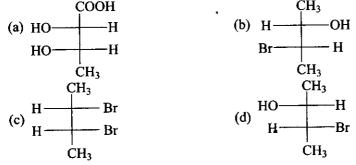
*

9. Compound which is	s not isomeri	c with d	iethyl eth	er is:					
(a) methyl-n-propy	l ether	(b) 1-butanol							
(c) 2-methyl-2-pro	panol		(d) butanone						
10. Which of the followisomer and position(a) Benzyl alcohol(b) o-cresol and position	isomer? and methoxy			be regarde	ed both as functional				
(c) Benzyl alcohol		i							
(d) Benzyl alcohol			ther						
11. Which of the follow		ınds can	exhibit e	nantiomeri	sm?				
(a) 3-hydroxy pror	anoic acid		(b) 3-hy	droxy buta	noic acid				
(c) 4-hydroxy buta	noic acid		(d) none	of these					
12. The functional ison	ners of ether	s are:							
(a) ketone			(b) aldel		•				
(c) alcohols			(d) ester		. 11.0				
13. Which of the follow									
				psed	(d) Fully eclipsed				
14. Total number of co		of ethane			(1) T C. 14-				
(a) 2	(b) 3		(c) 4		(d) Infinite				
15. Which of the follow	wing conforr	nations (of butane	is most sta	ible?				
(a) Skew	(b) Anti		(c) Gau	cne	(d) Eclipsed				
16. Maleic acid and fu			(h) ====	matrical isc	mar				
(a) position isome	Γ			metrical ison					
(c) enantiomers 17. Which of the follow	usina io o chi	ral mole	` ′	ALIONAL 10012					
(a) 1-chloro propa		rai inoic		iloro propa	ne				
(c) 1-chloro butan				iloro butan					
18. Which of the follo		iles has a	a meso st	ereoisomer	?				
Cl	Br								
					•				
(a) CH ₃ —CH—	$CH_2 - CH$	$-CH_3$							
(b) trans-2-hexen	e								
(c) CH ₃ —CH—	CH ₂ —CH ₂	CH ₂ -	Cl						
l Cl									
(d) Cl ₄₃ CH ₂ CH-		CH ₃							
Cl	Cl								
19. The number of me					,				
Cl	H ₃ ——CH——	СН— <u>С</u> Т	H—CH ₃						
	•) OH O:							
(a) 2	(b) 3	O11 O.	(c) 4		(d) 8				



26. Which one of the following statements regarding the projection shown below is correct?

- (a) Both the projections represent the same configuration
- (b) Both (I) and (II) are optically active
- (c) Only (I) is optically active
- (d) Only (II) is optically active
- 27. Which of the following is erythro form and optically inactive?



- 28. Which of the following would exhibit cis-trans isomerism?
 - (a) $CH_3CH_2CH = CH_2$
- (b) CICH=CHCl

(c) CICH=CCl₂

- (d) CH₂=CH—COOH
- 29. Which one of the following compounds does not show tautomerism?

(a)
$$CH_3CH_2NO_2$$
 (b) $CH_3 - C - N = O$

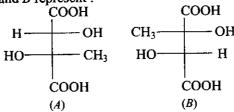
$$CH_3$$

$$CH_3$$

$$O O O$$

$$|| O O O$$

30. The structures A and B represent:



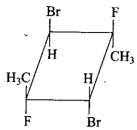
(a) enantiomers

(b) diastereomers

(c) homomers

(d) racemic mixture

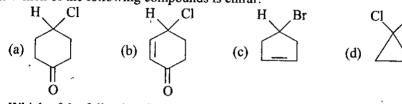
31. The compound has:



(a) plane of symmetry

- (b) axis of symmetry
- (c) center of symmetry

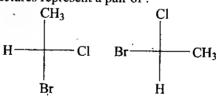
- (d) no symmetry
- 32. Which of the following compounds is chiral?



- 33. Which of the following dienes is chiral?
 - (a) CH_3 —CH=C= CH_2
- (b) CH_3 —CH=CH—CH= CH_2
- (c) CH_3 —CH=C=CH— CH_3
- (d) $CH_2 = CH CH_2 CH = CH_2$
- 34. The simplest alcohol that can exhibit enantiomerism:
 - (a) 1-propanol
- (b) 2-butanol
- (c) 2-propanol
- (d) 1-butanol

Br

35. The following structures represent a pair of:



(a) enantiomers

(b) diastereomers

(c) meso compound

- (d) homomers
- 36. Tautomerism is not exhibited by:

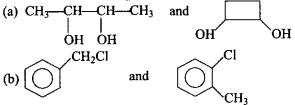
37. The two compounds may be considered as:

(a) position isomer

(b) chain isomer

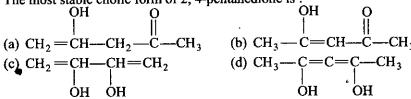
(c) stereoisomer

- (d) tautomer
- 38. Which of the following pairs of compounds is a ring-chain isomer?

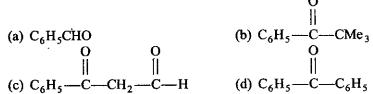




39. The most stable enolic form of 2, 4-pentanedione is :



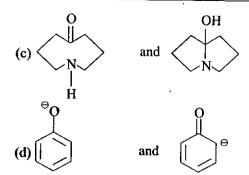
40. Which of the following compounds can exhibit tautomerism?



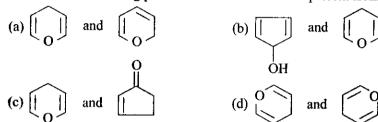
41. Among the following compounds, the one which will not show keto-enol tautomerism is:

(a)
$$CH_3$$
 (c) O (d) O

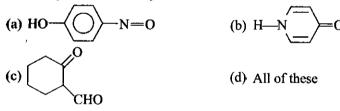
42. Which of the following pairs of structures does not represent tautomers?



43. Which of the following pairs of structures does not represent isomers?



44. The compound which may exhibit tautomerism:



45. Which of the following compounds will show geometrical isomerism?

(a) 2-pentyne

(b) 2-pentene

(c) 2-methyl propene

(d) 2-methyl-2-butene

46. Geometrical isomers are possible for:

47. Among the following compounds, the one which does not show geometrical isomerism is:

(a)
$$C_6H_5N = NC_6H_5$$

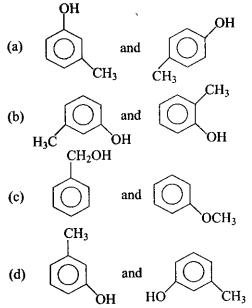
(b)
$$C_6H_5CH=CHC_6H_5$$

(c)
$$C_6H_5$$
— C — N — OH
 CH_3

(d)
$$C_6H_5 - C = N - CH_3$$

- 48. The number of alkynes possible with molecular formula C_5H_8 is:
 - (a) 2
- (b) 3
- (c) 4

- d) 5
- 49. Which of the following pairs of compounds are not isomers?



- 50. The total number of benzene derivatives with molecular formula C₆H₃Cl₃ is:
 - (a) 2
- (b) 3
- (c) 4
- (d) 5

- 51. A molecule is said to be chiral, only if:
 - (a) it is superimposable on its mirror image
 - (b) it is non superimposable on its mirror image
 - (c) it possesses stereogenic centers
 - (d) it can have different configuration
- 52. Which of the following compounds possesses chiral carbon?

(a)
$$CH_2$$
— CH — CH_2 — CH — CH_2 — CH — CH 2— CH — CH 2— CH 0— CH 2— CH 2— CH 2— CH 2— CH 3— CH 4— CH 2— CH 4— CH 2— CH 4— CH 2— CH 4— C

53. The number of chiral centers present in 3, 4-dibromo-2-pentanol is:

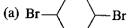
(a) 1

(b) 2

(c) 3

(d) 4

54. Among the following compounds, the one which can exhibit chirality is:



(b) CI Br

(c) Br

(d)

55. How many optically active stereoisomers are possible for 2, 3-butanediol?

(a) 1

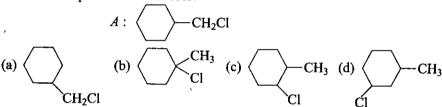
(b) 2

(c) 3

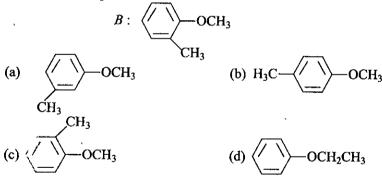
(d) 4

LEVEL-3

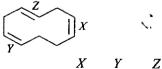
1. Which is not position isomer of A?



2. Metamer of compound B is :



3. Types of geometrical isomerism shown at point X, Y and Z of the following compound respectively are:



X

Z

Y

X

(a) vis

Y cis

trans

(b) cis trans

(c) trans cis cis

(d) cis trans cis

4. Cis-trans isomerism is shown by:

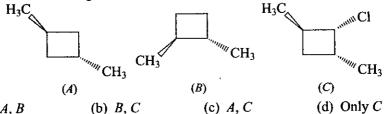
(a)

(b)

trans

87

5. Out of the following which are chiral?



(a) A, B

(b) B, C

(d) Only C

6. C₈H₁₆ that can form cis-trans isomerism and also chiral center is:



(c) both of these

(d) none of these

7. Compound A below:

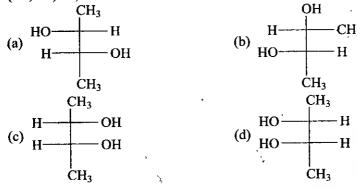
$$A: \begin{array}{c|c} CH_3 \\ H & CH_3 \\ \hline CH_3 \end{array}$$

- (a) is called three enantiomer
- (b) is called erythro enantiomer
- (c) is called diastereomer
- (d) is a racemic compound
- 8. Following stereo-structure of tartaric acid represents:

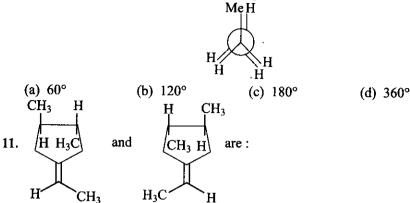


- (a) d or l form
- (b) racemic form (c) meso form
- (d) trans form

9. (2R, 3R) -2, 3 bantanediol is:



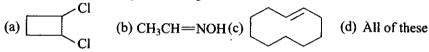
10. Following eclipsed form of propane is repeated after rotation of:



H

(a) enantiomers

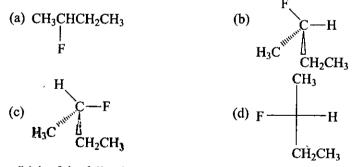
- (b) diastereomers
- (c) geometrical isomers
- (d) same structure
- 12. Which of the following will form geometrical isomers?



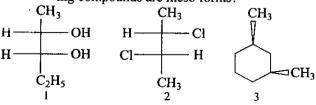
13. The number of enantiomers of the compound CH₃ Br Br

- (a) 2
- (b) 3
- (c) 4
- (d) 6

14. The structure of (S)-2-fluorobutane is best represented by:



15. Which of the following compounds are meso forms?



(a) 1 only

(b) 3 only

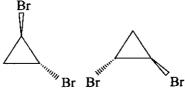
(c) 1 and 2

(d) 2 and 3

16. The S enantiomer of ibuprofen is responsible for its pain-relieving properties, which one of the structures is (S)-ibuprofen?

17. A naturally occurring substance has the constitution shown. How many stereoisomers may have this constitution?

18. Relate the following compounds:



(a) same

(a) 2

- (b) enantiomers
- (c) diastereomers (d) meso
- 19. Relate the following compounds:

(a) homomers

(b) enantiomers

(c) diastereomers

(d) different compounds

20. Identify relation between these two compounds:

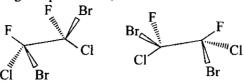
(a) homomers

(b) enantiomers

(c) diastereomers

(d) different compounds

21. Relate the following compounds:

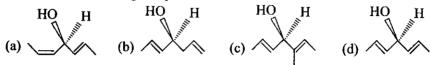


(a) homomers

(b) enantiomers

(c) diastereomers

- (d) meso
- 22. Which of the following compounds is achiral?



- 23. The observed rotation of 2.0 gm of a compound in 10 mL solution in a 25 cm long polarimeter tube is + 13.4°. The specific rotation of compound is:
 - (a) $+30.2^{\circ}$
- (b) -26.8°
- (c) $+26.8^{\circ}$
- (d) $+40.2^{\circ}$
- 24. (+)-2-butanol has $[\theta]_{\lambda}^{25} = +13.9^{\circ}$. A sample of 2-butanol containing both the enantiomers was found to have a specific rotation value of -3.5° under similar condition. The percentage of the (+) and (-) enantiomer present in the sample are, respectively:
 - (a) 37.4% and 62.6%

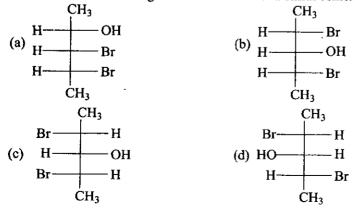
(b) 62.6% and 37.4%

(c) 42.2% and 57.8%

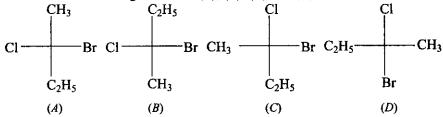
- (d) 35.5% and 64.5%
- 25. In the structure the configurations at chiral centers are:



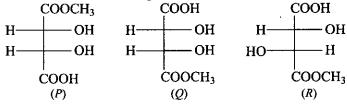
- (a) 2R, 3R
- (b) 2S, 3R
- (c) 2R, 3S
- (d) 2S, 3S
- 26. In which of the following structures C-3 is not a chiral center?



27. Consider the following structures (A), (B), (C) and (D):



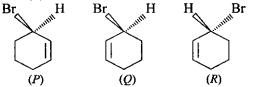
- (a) B and C are identical
- (b) A and B are enantiomers
- (c) A and C are enantiomers
- (d) B and D are enantiomers
- **28.** The correct statement about compounds (P), (Q) and (R):



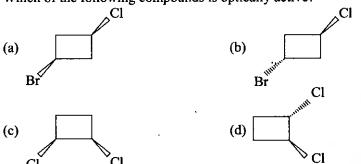
- (a) P and Q are identical
- (b) P and Q are diastereomers
- (c) P and R are enantiomers
- (d) P and Q are enantiomers
- 29. Which of the following molecules is chiral?
 - (a) $CH_3CH_2CH = C = CH_2$
- (b) CH_3 —CH=CH—CH= CH_2
- (c) $CH_3CH = C = CHCH_3$
- (d) $CH_2 = CH CH_2 CH = CH_2$

Br

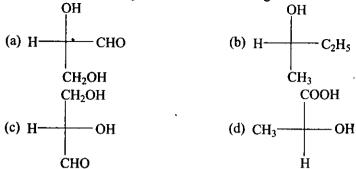
30. Which of the following statements about the relationships of the structure (P), (Q), (R) and (S) is incorrect?



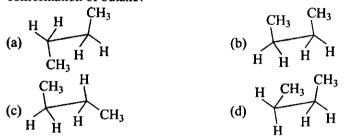
- (a) P and R are enantiomers
- (b) P and R are identical
- (c) Q and S are identical
- (d) P and Q are enantiomers
- 31. Which of the following compounds is optically active?



32. Which of the following structures has D-configuration?



33. Which of the following sawhorse projection formulae represents the gauche conformation of butane?



- **34.** How many gauche conformations are possible for n-butane?
 - (a) 2
- (b) 3
- (c) 4
- (d) 1
- 35. The most stable conformation of cyclohexane is:
 - (a) Boat
- (b) Half-chair
- (c) Chair
- (d) Twist-boat

36. Which of the following conformation of *n*-butane has a center of symmetry?

37. Which of the following conformations of *n*-butane has a plane of symmetry?

38. The most stable conformation of 2, 3-dimethyl butane is:

(a)
$$H$$
 CH_3 (b) H_3C CH_3 H_3C CH_3 CH_3 CH_3 (d) None of these CH_3 CH_3

39. Total number of stereoisomers of the compound

CH_3 —CH=CH—CH=CH— CH_3 is: OH

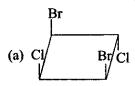
- (a) 2
- (b) 3
- (c) 4
- (d) 8

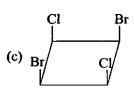
40. Which of the following pairs of structures represents conformation isomers?

- (a) **and**
- (b) ****
- and

- (c) ____ and ____
- $(d) = C = \setminus and = C = \setminus$

41. Which of the following structures is chiral?





Cl Br Cl (d) Br Cl

42. Which of the following compounds can be optically active?

- (a) $_{H_3C}^{H_3C}$ \searrow $_H^{C1}$
- (b) CH₂
- c) H C=C=C CH_3

Select correct answer using the codes given:

(a) 1 and 3

(b) 1 and 2

(c) 2 and 3

(d) 1, 2 and 3

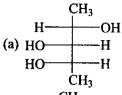
43. Which one of the following compounds will show enantiomers?

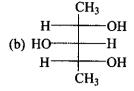
- (b) H_3C — $\langle \bigcirc \rangle$ — CH_3

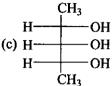
(c) \bigcirc CH₃

(q) $\langle O \rangle$ OH

44. The meso form of 2, 3, 4-pentanetriol is:







(d) Both (b) and (c)

45. Which of the following compounds is chiral?

$$\begin{array}{c} Cl \\ CH_3 \\ CH - CH_3 \\ CH_4 \\ CH_3 \\ CH_5 \\$$

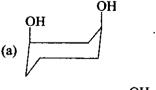
(b)
$$C=N$$
 C

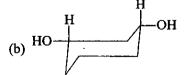
(d) All of these

46. Which one of the following is the most stable conformer?

OH

47. Which one of the following is most stable?





48. Which among the following compounds will show geometrical isomers?

(a)
$$CH_3$$
— CH = CH_2

(b) CH_3 — C = CH_2
 CH_3

(c) CH_3 — C = CHD

(d) CH_3 — CH = CHD

49. First member of optically active alkene is:

50. Consider the following pairs of compounds:

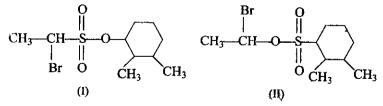
Which among the following statements is correct?

- 1. Both are enantiomers
- 2. Both are in three form
- 3. Both are diastereomers
- 4. Both are in erythro form
- (a) 1 and 2

(b) 1, 2 and 3

(c) 2 and 3

- (d) 3 and 4
- 51. Which type of isomerism is observed between I and II?



- (a) Functional isomerism
- (b) Metamerism

(c) Optical isomerism

(d) Geometrical isomerism

52. Mention the correct relationship between I and II:

$$Br$$
 Br
 SO_3H
 Br
 Br
 SO_3H
 Br
 Br
 SO_3H
 Br
 Br
 SO_3H

(a) Chain isomer

(b) Position isomer

(c) Identical

- (d) Stereoisomer
- 53. Number of functional groups present in the following compound is:

- (a) 5
- (c) 6

(d) 8

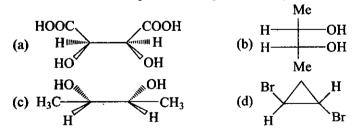
54. Stereoisomer possible for following compound:

(a) 8

(b) 16

(c) 32

- (d) 64
- 55. Which of the following will show optical activity?



56. Compound X can exist in how many orientations?

$$X = H - C - CH = C$$

$$CH_3$$

$$CH_2CH_3$$

$$CH_3$$

$$CH_3$$

(a) 1

(b) 2

(c) 3

(d) 4

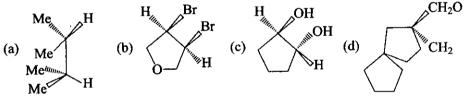
57. Which of the following will not have any stereoisomer?

(a)
$$C = C = C$$
 (b) $C = C = C = C$ F (c) $C = C = C = C$ F (d) $C = C = C$ F

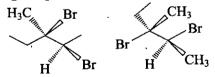
58. Which of the following compounds is optically inactive?

(a)
$$CH_3$$
 CH_2Cl (b) CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_4 CH_5 CH_5

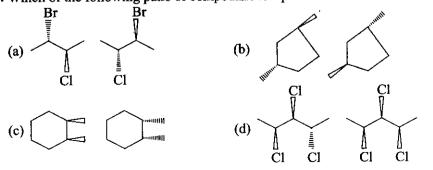
59. Which of the following structures represent meso compound?



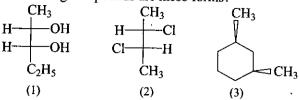
60. How are the following compounds related?



(a) Diastereomers (b) Enantiomers (c) Meso form (d) Identical 61. Which of the following pairs of compounds is a pair of enantiomers?



62. Which of the following compounds are meso forms?



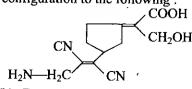
- (a) 1 only
- (b) 3 only
- (c) 1 and 2
- (d) 2 and 3
- 63. How many isomers are possible for the following molecule?

- (a) 1
- (b) 2
- (c) 3
- (d) 4
- 64. What are the correct designations for the structure below?

- (a) E, E
- (b) Z, E
- (c) E, Z
- (d) No stereoisomerism is possible
- 65. The following compounds differ in respect of:

- (a) their chemical and physical properties
- (b) the direction in which they rotate plane of polarized light
- (c) their interaction with molecule
- (d) all are correct
- 66. How many structural isomers are possible when one of the hydrogen in compound given below is replaced by chlorine atom?

67. Assign double bond configuration to the following:



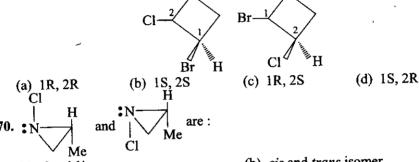
(a) E

(a) 6

- (b) Z
- (c) E, Z
- (d) Z, Z

68. Which of the following pairs are geometrical isomers?

- (c) Both (a) and (b)
- (d) None of the above
- 69. The configuration of 1 and 2 carbon atom in the following compounds is:

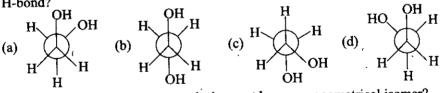


(a) d and l isomer

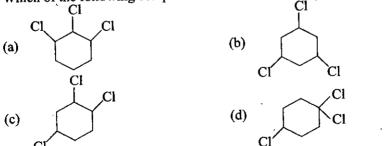
(b) cis and trans isomer

(c) functional isomer

- (d) position isomer
- 71. Which of the following conformers of 1, 2-diol cannot form intramolecular H-bond?



72. Which of the following compounds does not have any geometrical isomer?



- 73. If a mixture of 2-bromobutane has enantiomeric excess of 50% of (+)-2-bromobutane, the stereoisomeric composition of the mixture with respect to
 - (+) and (-) enantiomer respectively is:
 - (a) 75% (+) and 25% (-) (b) 70% (+) and 30% (-)
 - (c) 80% (+) and 20% (-)
- (d) 25% (+) and 75% (-)

74. The following compounds differ in:

$$\overset{H}{\underset{Cl}{\longleftarrow}}\overset{Cl}{\underset{Cl}{\longleftarrow}}\overset{H}{\underset{H}{\longleftarrow}}\overset{Cl}{\underset{H}{\longleftarrow}}$$

(a) configuration (b) conformation

(c) structure

(d) chirality

75. How many stereomers are possible for following molecule?

(a) 4

(b) 8

(c) 12

(d) 16

76. Which of the following molecules have dipole moment?

F

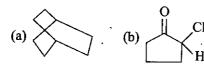
$$C = C = C$$
 $C = C$
 $C =$

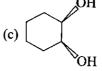
(b) B and C

(c) C and E

(d) B and E

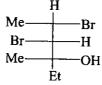
77. Which of the following molecules is expected to rotate the plane polarized light?

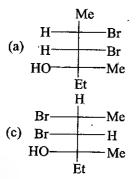


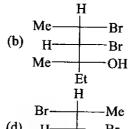


⇒CH₃ (d)

78. Which of the following is the enantiomer of the compound shown below?







(d) H-Et -OH

79. Geometrical isomerism is possible in:

(a)

(c)

(d)

80.
$$\frac{Br}{H}$$
 $\frac{CH_3}{H}$ and $\frac{H}{Br}$ $\frac{CH_3}{H}$ are :

 CH_3

(a) enantiomers

(b) diastereomers

(c) conformers

- (d) homologous
- 81. Which of the following compounds will be optically active?

 C_2H_5

H H is 36° then that produced by 82. If optical rotation produced by Cl Cl

 CH_3

CH₃

(a) -36°

(b) 0°

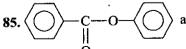
(c) $+26^{\circ}$

(d) Unpredictable

- (a) conformational isomers
- (b) configurational isomers
- (c) constitutional isomers
- (d) identical

84.
$$H_{3}C$$
 $H_{3}C$ $H_{3}C$

- (a) conformational isomers
- (b) stereoisomers
- (c) constitutional isomers
- (d) identical



- are:
 - (a) position isomers

(b) chain isomers

(c) functional isomers

(d) metamers



(a) functional group isomers

(c) optical isomerism

(b) metamerism

(d) geometrical isomerism

Which among these are stereoisomers?

(a) I and II

(b) I and III

(c) II and III

(d) all of these

Which among these can exhibit tautomerism?

(a) I only

(b) II only

(c) I and III HO.

(d) II and III

89.
$$(X)$$
 \rightleftharpoons (Y) (Y) (Z)

Stability order among these tautomer is:

(a) X > Y > Z

(b) Y > X > Z

(c) Z > X > Y (d) Y > Z > X

Among these compounds, the order of enol content should be:

(a) II > III > I

(b) I > II > III

(c) III > II > I

(d) I > III > II

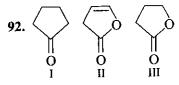
Which of these compounds will exhibit geometrical isomerism?

(a) I

(b) II

(c) III

(d) None of these



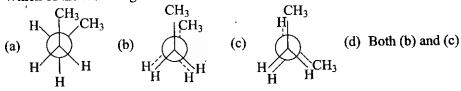
Among these compounds the order of enol content should be:

(a) I > II > III

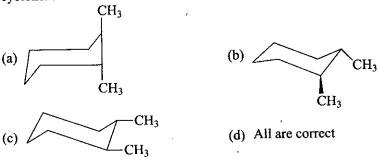
(b) III > II > I

(c) II > I > III

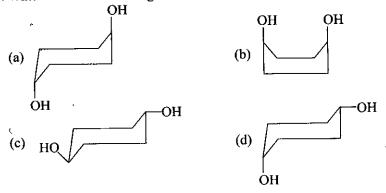
- (d) $\Pi > \Pi > I$
- 93. Which of the following conformers of n-butane has torsional strain?



94. Which one of the following is most preferred conformation of 1, 2-dimethyl cyclohexane?

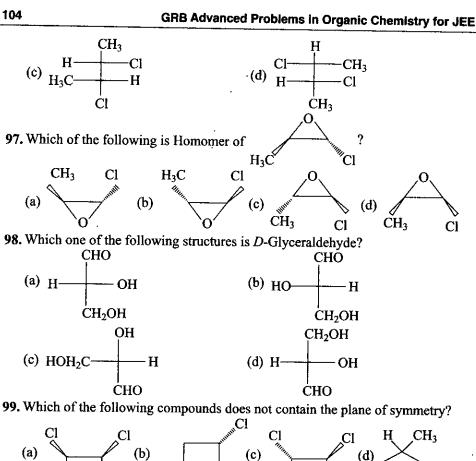


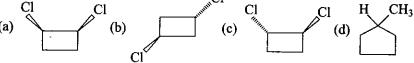
95. Which one of the following is the most stabilised conformer of 1, 4-cyclohexane diol?



96. Which of the following compounds is optically active?

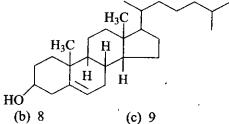






100. How many chiral centers are present in tetracycline?

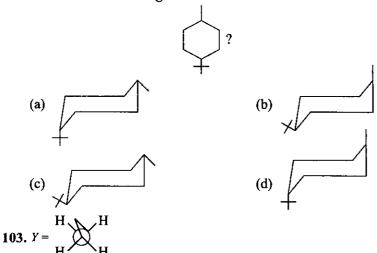
101. How many chiral centers are present in cholesterol?



(a) 7

(d) 5

102. Which of the following is the most stabilised conformer of



Compound Y is projection formula of:

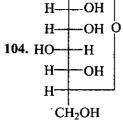


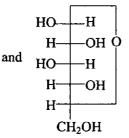




are:

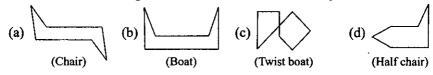




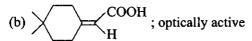


- (a) diastereomers
- (b) enantiomers
- (c) tautomers
- (d) conformers

105. Which of the following is the least stable conformer of cyclohexane?



106. Which of the following pairs is correctly matched?

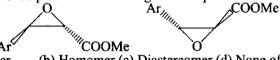


(c)
$$H_2N$$
 $C=C=C$ CH_3 ; optically active COOH NO_2

107. Which of the following nomenclatures can be used for given conformation?

- (a) Only D, L
- (c) D/L, Erythro/threo

- (b) Only erythro, threo
- (d) D/L, R/S, Erythro/threo
- 108. Find out relationship between following two compounds:



- , (a) Enantiomer
- (b) Homomer (c) Diastereomer (d) None of these
- 109. Identify correct 2-D representation of following molecule.

110. Identify the molecule which is meso.

111. Find outmost stabilise conformer of following molecule.

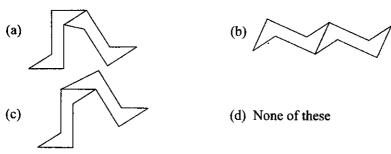
112. Identify stabilise chain conformer of following molecule.

Me, OH

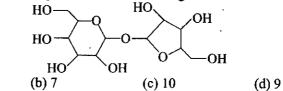
113. Identify stabilise chain conformer of following molecule.

114. Find out correct representation of trans-decaline.

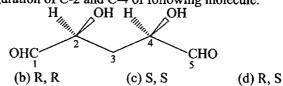
(a) 8



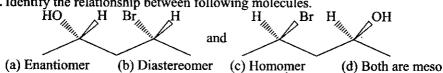
115. Calculate no. of stereogenic center in following molecule.



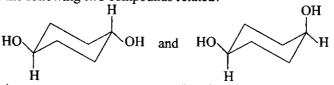
116. Assign the configuration of C-2 and C-4 of following molecule.



(a) S,R (b) R, R (c) S, S 117. Identify the relationship between following molecules.



118. How are the following two compounds related?



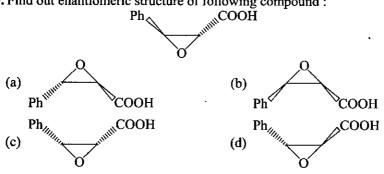
(a) Enantiomer

(b) Diastereomer

(c) Homomer

(d) Racemic mixture

119. Find out enantiomeric structure of following compound:



120. Find out no. of sterogenic center in following compound:

(a) 4 (b) 5 (c) 3 121. How are the following two compounds are related?

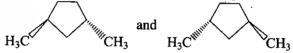
Br CH₂OH HOH₂C H

- (a) Constitutional isomer
- (b) Diastereomer

(c) Enantiomer

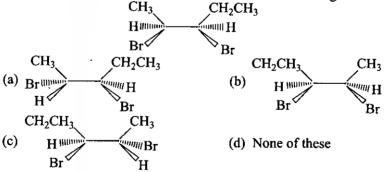
(d) Homomer

122. Choose incorrect statement regarding following compounds:

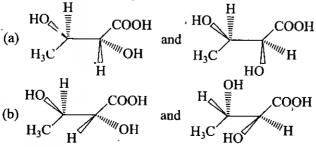


- (a) The boiling point of both compounds are same
- (b) Both are optically active
- (c) Equal mixture of both compounds are optically inactive
- (d) Both are diastereomers

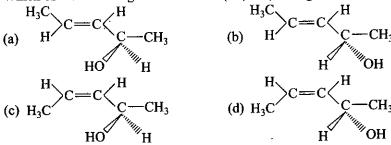
123. Which of the following is not diastereomeric structure of given compound?



124. Identify the set of compounds which are enantiomers?



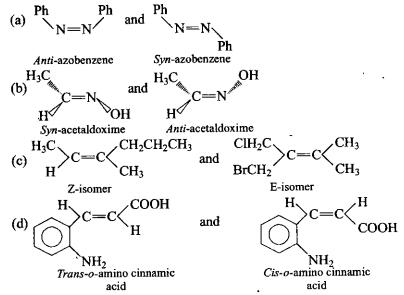
125. Which of the following molecule have (2R, 3-Z) configuration?



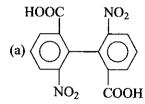
EXERCISE-2 MORE THAN ONE CORRECT ANSWERS

1. Select 'cis' isomer among the following:

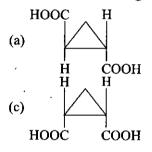
2. For which of the following pairs of compounds are the correct notations given?

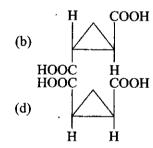


- 3. Which of the following compounds will exhibit geometrical isomerism?
 - (a) CH_3 —CH=CH—COOH
- (b) Br—CH=CH—Br
- (c) C_6H_5 —CH=N—OH
- (d) O
- 4. Which of the following compounds exhibit optical isomerism?

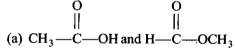


- (b) $H_2C = C = CH_2$
- (c) $\stackrel{\text{Ph}}{\underset{\text{H}_3\text{C}}{>}} \text{C=C-C} \stackrel{\text{Ph}}{<} \text{CH}$
- (d) $\underset{\text{H}_2}{\overset{\text{C}}{\cap}} C = C \underset{\text{C}}{\overset{\text{C}}{\cap}} \underset{\text{H}_2}{\overset{\text{H}_2}{\cap}}$
- 5. Which of the following represents a pair of enantiomers?





6. Which of the following represent correct matching?



Metamers

- (b) CH_3 — CH_2 — $C \equiv CH$ and CH_3 — $C \equiv C$ — CH_3
- Position isomers
- (c) CH₃CH₂CH₂NH₂ and CH₃ CH—CH₃

 |
 NH₂

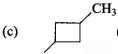
Tautomers

(d) CH₃CH₂OH and (CH₃)₂O

Functional isomers

7. Which crithe following cycloalkanes will show cis-trans isomerism?







H₃C

8. Which of the following are correctly matched?

Compounds

Number of geometrical isomers

(a)
$$CH_3$$
— CH = CH — CH = CH — Ph

(b)
$$CH_3$$
— $(CH=CH)_4$ — CH_3

2

(c)
$$H_2C = CH - CH = CH_2$$

10

(d)
$$H_3C$$
— $(CH = CH)_5$ — CH_3

20

9. Which of the following will have a trans isomer?

$$\text{(a)} \xrightarrow[H]{H_3C} C = C \left< \xrightarrow[H]{H_3}$$

(b)
$$\stackrel{\text{Cl}}{\longrightarrow}$$
 C=C $\stackrel{\text{Cl}}{\longleftarrow}$

(c)
$$^{\text{H}_3\text{C}}_{\text{H}}$$
 C=C $^{\text{CH}_3}_{\text{H}}$

10. Which of the following is chiral?

(a)
$$C_2H_5$$
—P=O
 C_6H_5

(b)
$$Ph$$
 $S=0$

$$\begin{array}{c} CH_{3} \\ | \\ (c) C_{2}H_{5} - N \xrightarrow{\oplus} - H \\ | \\ C_{6}H_{5} \end{array}$$

(d)
$$H_3C$$
 $S=0$

11. Which of the following compounds show tautomerism?

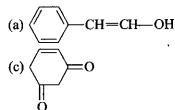
12. Keto-enol tautomerism is observed in:

(a)
$$C_6H_5$$
—C—H

O

||
(c) Ph —C—Ph

13. Tautomerism is exhibited by:



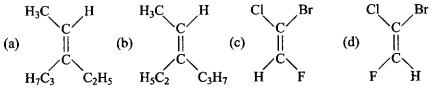
- 14. Cis-2-butene and trans-2-butene are:
 - (a) geometrical isomers

(b) diastereomers

(c) enantiomers

- (d) position isomers
- 15. Which of the following can exist in syn and anti form?
 - (a) Ph N = N OH

- (b) Ph—N—N—Ph
- (c) Ph—CH = N—OH
- (d) $Ph_2C = N OH$
- 16. The Z-isomers among the following are:



- 17. Which of the following statements are correct about tautomers?
 - (a) They possess different electronic and atomic rearrangement
 - (b) They possess different electronic but same atomic arrangement
 - (c) They have different atomic arrangement but same electronic arrangement
 - (d) They exist in equilibrium
- 18. Which of the following compounds would be optically inactive?

(a)
$$H_2C = C = CH_2$$

(c)
$$H_3C$$
— CH = C = CH — CH_3

$$(d) \begin{array}{c} CH_3 \\ H \longrightarrow OH \\ CH_3 \longrightarrow H \end{array}$$

19. In which of the following the enol form is dominant over keto form?

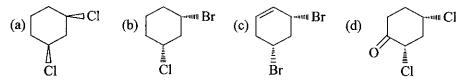




20. Which of the following are optically active?

(a)
$$\stackrel{Cl}{H} > C = C - C = C < \stackrel{C_2H_5}{H}$$
 (b) $\stackrel{H_3C}{H} > C = C = C = C < \stackrel{CH_3}{H}$ (c) $CH_3 = CH = COOH$ (d) $\stackrel{H_3C}{H} > C = C = C = C < \stackrel{CH_3}{H}$

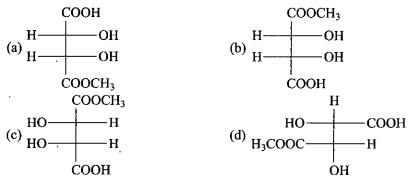
21. Which of the following compounds do not have the plane of symmetry?



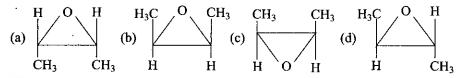
22. Which of the following are optically active?

(a)
$$OH$$
 (b) Br OH (c) CH_3 (d) H_3C $C-C-C-C$ CH_3 HO $C-C-C-C$

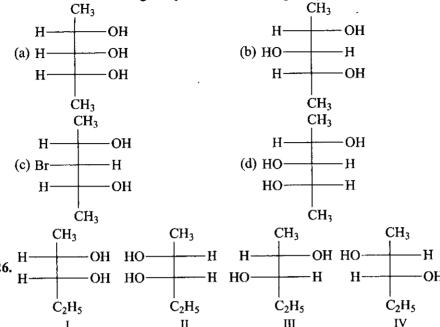
23. Which of the following are identical molecules?



24. Which of the following are identical molecules?

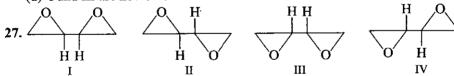


25. Which of the following compounds can have superimposable mirror image?



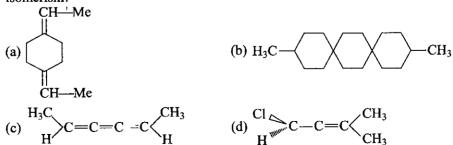
Which of the following statements are true about these isomers?

- (a) I and II are a pair of enantiomers
- (b) III and IV are a pair of enantiomers
- (c) II is the diastereomer of III and IV
- (d) I and III are homomers



Which of the following statements are correct about these molecules?

- (a) I is a meso compound
- (b) I and III are identical
- (c) II and IV are a pair of enantiomers (d) II and III are diastereomers
- 28. Which of the following compounds are optically inactive but exhibit geometrical isomerism?

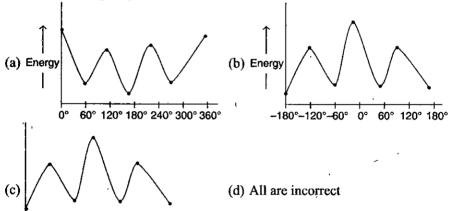




- 29. Magnitude of specific rotation of a compound is independent of:
 - (a) solvent
- (b) concentration (c) length of tube (d) temperature

30. Enantiomers have:

- (a) all physical properties same except their action on plane polarized light which is equal in magnitude but opposite in direction.
- (b) all chemical properties same except when reagent is chiral in that case, reactivity of enantiomer will be different.
- (c) opposite configuration of all chiral centers according to CIP rule.
- (d) superimposable image of each other.
- 31. Which of the following plots are correct for potential energy of butane as a function about $C_2 - C_3$ bond?



32. A pair of enantiomers is:

- (a) a pair of non superimposable mirror image of each other
- (b) a pair of superimposable image of each other
- (c) always optically active if one is dextrorotatory then other will be laevorotatory by same magnitude
- (d) compounds having same boiling points

60° 120° 180° 240° 300° 360°

33. A racemic mixture is:

- (a) always equimolar mixture of a pair of enantiomers
- (b) always equimolar mixture of a pair of diastereomers
- (c) always optically inactive
- (d) always optically active



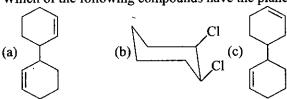




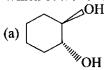
Which of the following statements are true about these molecules?

- (a) I and II are a pair of enantiomers
- (b) III is metamer of I and II

- (c) III is diastereomer of I and II
- (d) III is not stereoisomer of I and II
- 35. Which of the following compounds have the plane of symmetry?



36. Which of the following compounds can exhibit geometrical isomerism?



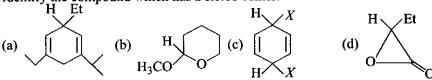
(b)
$$_{\text{H}}^{\text{H}_3\text{C}}$$
 $c = c = c < _{\text{H}}^{\text{CH}_3}$

(c)
$$^{\text{H}_3\text{C}}_{\text{H}}$$
 C=C=C=C $^{\text{CH}_3}_{\text{H}}$

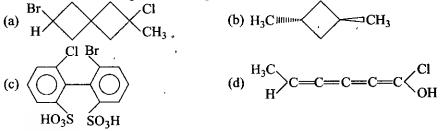
- (d) C_2H_5 —CH=CH—CH=CH— CH_3
- 37. Which of the compounds shown below are isomers?



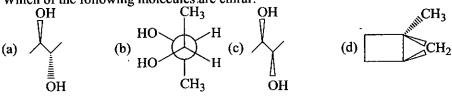
38. Identify the compound which has a stereo center.



39. Which of the following will show optical isomerism?



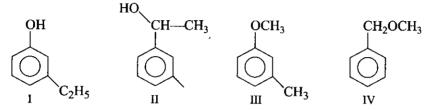
40. Which of the following molecules are chiral?





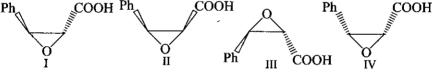
41. The correct statements about the compound given below.

- (a) Compound is optically active
- (b) Compound possesses center of symmetry
- (c) Compound possesses plane of symmetry
- (d) Compound possesses axis of symmetry
- 42. Consider following compounds:



Choose the correct statements from the following.

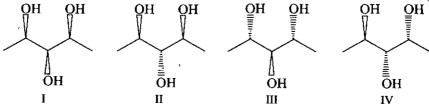
- (a) I, II and III are functional isomers (b) I and II are position isomers
- (c) III and IV are chain isomers
- (d) III and IV are metamers
- 43. Which of the following are correct statement regarding these molecules.



- (a) Compound I and II are diastereomers
- (b) Compound II and IV are enantiomers
- (c) Compound I and III are enantiomers
- (d) Compound III and IV are homomers
- 44. Which of the following are correct regarding these molecule.

$$H_3C$$
 H_3C
 H_3C
 H_3C
 H_3C
 H_3C

- (a) Both compounds contain plane of symmetry
- (b) Both are enantiomers
- (c) Both are diastereomers of each other
- (d) Both are homomers
- **45.** Find the correct statements regarding following molecules.



- (a) I, II and III are meso
- (c) I and IV are diastereomers
- (b) II and III are enantiomers
- (d) III and IV are diastereomers

EXERCISE-3 LINKED COMPREHENSION TYPE



Passage-1

Presence of chiral center is not an essential condition to show optical isomerism. Essential condition is, compound should show non-superimposable mirror image.

Allenes do not contain chiral center but show optical isomerism when different groups are attached on double bonded carbons.

Biphenyls also show optical isomerism when both rings are perpendicular to each other and any ring should not contain plane of symmetry.

1. Which of the following compounds is optically inactive?

(a)
$$H$$

Cl

(b) H

Cl

CH₃

H

OH

H

CH₃

(c) H

Cl

(d) H

Cl

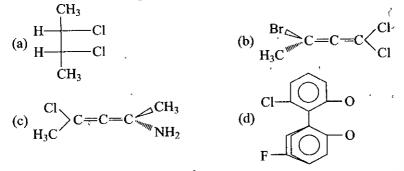
 H
 H

Cl

 H

2. Which of the following biphenyl compounds is optically active?

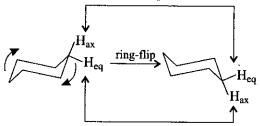
3. Which of the following compounds can be resolved in enantiomeric form?



Passage-2

Cyclohexane exist as two chair conformations in rapid equilibrium at room temperature.

Each carbon atom on a cyclohexane ring has one axial and one equatorial hydrogen. Ring-flipping converts axial H's to equatorial H's and vice-versa.

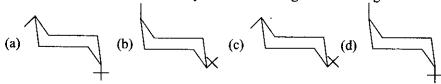


In substituted cyclohexane, groups larger than hydrogen are more stable in the equatorial position.

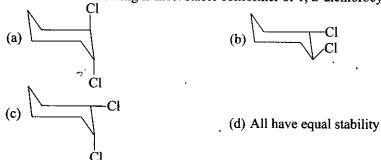
The cis isomer has two groups on the same side of the ring, either both up or both down.

The trans isomer has two groups on opposite side of the ring one up and one down.

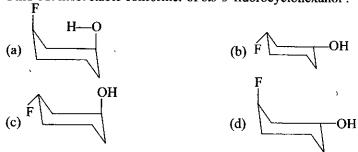
4. Find out most stable substituted cyclohexane among the following:



5. Which of the following is most stable conformer of 1, 2-dichlorocyclohexane?



6. Find out most stable conformer of cis-3-fluorocyclohexanol:





Passage-3

Conformations are different arrangements of atoms that are interconverted by rotation about single bond.

In eclipsed conformation, the C—H bond on one carbon is directly aligned with C—H bond on the adjacent carbon.

In staggered conformation, the C—H bond on one carbon bisect the H—C—H bond angle on adjacent carbon.

The angle that separates a bond on one atom from a bond on a adjacent atom is called a dihedral angle.

A staggered conformation with two larger groups 180° from each other is called anti. A staggered conformation with two larger group 60° from each other is called gauche.

7. Identify the most stable conformer of 2-fluoro ethanol among the following:

8. Which of the following is gauche conformer?

$$(a) \begin{array}{c} H \\ H \\ CH_3 \\ CH_3 \\ (b) \\ H_3C \\ H \\ (c) \\ H_3C \\ H \\ (d) \\ H \\ ($$

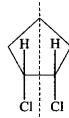
9. Which of the following conformer of butane has minimum energy?

Passage-4

A line which bisects a compound in two equal parts and both parts appear to be the mirror image of each other, such kind of symmetry is known as plane of symmetry.

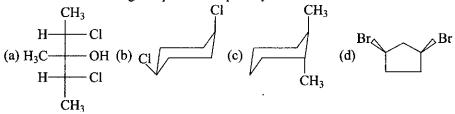
Any molecule that has a internal mirror plane of symmetry cannot be chiral, even though it may contain asymmetric carbon atoms.

10. Which of the following compounds does not contain plane of symmetry?

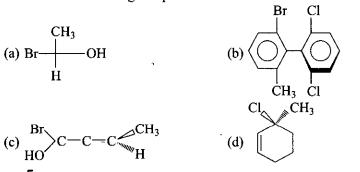


(a)
$$\begin{array}{c} CH_3 \\ H \\ OH \\ CH_3 \end{array}$$
 (b) $\begin{array}{c} CI \\ CI \\ CI \end{array}$ (c) $\begin{array}{c} CI \\ CI \\ CI \end{array}$

11. Which of the following compounds is optically active?

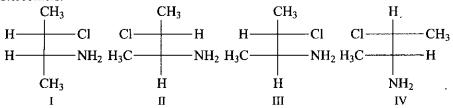


12. Which of the following compounds is not chiral?



Passage-5

R. S-configuration is a useful tool for determination of enantiomers, diastereomers and homomers. If configuration of all chiral centers are opposite then structures are enantiomers, if all chiral centers have same configuration then they are homomers and if some have same configuration and some have opposite configuration then they are diastereomers.



- 13. Among above structures find out enantiomeric structures:
 - (a) II and III

(b) I and II, II and IV

(c) I and IV

(d) III and IV

- 14. Find out homomers:
 - (a) I and III
- (b) II and IV
- (c) I and IV (d) III and IV
- 15. Which of the following is not diastereomer?
 - (a) I and III
- (b) II and III
- (c) III and IV
- (d) II and IV

EXERCISE-4 MATRIX MATCH TYPE



1. Column (I)

$$(C) Cl$$

$$CH_3$$

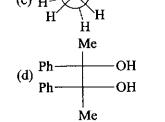
$$(C) CH_3$$

$$(C) Cl$$

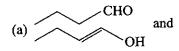
$$H_3C \longrightarrow H$$

$$Cl$$

2. Column (I)



3. Column (I)



Column (II)

- P. Plane of symmetry
- Q. Meso
- R. Optically active
- S. Geometrical isomerism

Column (II)

- P. Meso
- Q. Anti conformer
- R. Cis-isomer
- S. Eclipsed conformers

Column (II)

P. Ring chain tautomers

Q. Functional isomers

Me Me. N and OH and HC

- R. Tautomerism
- S. Metamerism

4. Column (I)

Column (II) H₃C HQ (a) H_3C CH₃ P. Cis-compound HO Br Br CH₃ ЮĤ

- R. Optically active
- S. Optically inactive

5. Column (I)

(a)
$$^{\text{Cl}}_{\text{H}}$$
 $>$ $c = c = c < ^{\text{H}}_{\text{Cl}}$

(b)
$$_{\rm H}^{\rm H}$$
 \sim $_{\rm C}$ \sim $_{\rm Cl}^{\rm H}$

Column (II)

- P. Polar molecule
- Q. Optically active
- R. Optically inactive

H (d) H

S. Symmetry element

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS



1. Total number of stereoisomers possible for the following compound is.

2. Find out number of stereogenic centers present in following compound 'simvastatin'

3. Find out number of compounds those have 'S' configuration from following.

4. Identify number of compounds which are meso.

Br OH
$$CH_3$$
 CH_3 OH CH_3
 CH_3 OH CH_3

1.- -<u>-----</u>

$$H_3C$$
 CH_3
 Br
 CH_3
 CH

5. Total number of stereoisomer possible for the compound

$$H_3C$$
— CH = CH — CH = CH — CH = CH — Ph

6. How many stereogenic centers have 'R' configuration in following compound zocor.

7. Find out number of conformation those have Cis geometry.

$$CH_3$$
 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3

8. Identify number of compounds that can show geometrical isomerism.

- **9.** Find out number of structural isomers possible for C_6H_{14} .
- 10. Identify number of carbohydrate that have L-configuration, from following.

11. The following compound may exist in two or more stereoisomers

- (a) Total number of stereoisomers.
- (b) Number of enantiomeric pairs.
- (c) Number of meso compounds.
- 12. "A pair of stereoisomer might be classified in various ways depending upon their exact nature"

How many following terms could properly be applied to a pair of stereoisomers, assuming their nature permits?

- (a) They might be meso isomers.
- (b) They might be tautomers.
- (c) They might be enantiomers.
- (d) They might be diastereomers.
- (e) The might be conformational isomers.
- (f) The might be constitutional isomers.
- (g) They might be configurational isomers.
- (h) None of the above statements are true.



ANSWERS®



Exercise-1: Only One Correct Answer

Level-1								4
1 . (b)	2. (c)	3. (c)	4. (c)	5. (c)	6. (b)) 7. (c)	8 (h)	9. (a) 10. (c)
11. (d)	12. (d)	13. (a)	14. (d)	15. (b)	16. (d)			19. (d) 20. (d)
	- 22. (c)	23. (c)	24. (d)	25. (c)	26. (c)			
30. (a)	31. (c)	32, (c)	33. (c)	34. (c)		36. (d)		38. (d) 39. (d)
40. (a)	41. (a)	42. (c)	43. (a)	44. (a,c)		4		48. (b) 49; (b)
50 . (d)							•	
		•						<u>.</u>
Level-2		,				3		
1 . (d)	2. (c)	3. (d)	4. (a)	5. (c)	6 . (b)	7, (a)	8. (c)	9. (d) 10. (c)
11 . (b)	12. (c)	13. (d) ["]	14 . (d)	15. (b)	16. (b)	17. (d)		19. (a) 20. (c)
21. (b)	22. (c)	23. (a)	24. (d)	25. (b)	26. (d)	27. (c)	28. (b)	29. (b) 30. (c)
31. (c)	32. (b)	33. (c)	34. (b)	35. (d)	36. (b)	37. (b)	38. (c)	39. (b) 40, (c)
41 . (b)	42. (d)	43 . (d)	44. (d)	45. (b)	46. (c)	47. (d)	~48. (b)	49. (d) 50. (b)
51 . (b)	52. (d)	53. (c)	54. (d)	55. (b)				,
Level-3		•				,	•	
1. (a)	2. (d)	3. (a)	4. (a)	5. (b)'	6. (a)	7. (b)	8. (c)	9. (a) 10, (b)
11. (a)	12. (d)	•	14. (c)		16. (d)	17. (d)		19. (a) 20. (b)
21. (b)	22. (d)	23. (c)			26. (d)	27. (d)		29. (c) 30. (a)
31. (d)		33. (d)		35. (c)		37. (a)		39. (c) 40, (b)
41. (d)	42. (c)	43. (c)			46. (c)	47. (a)		19. (a) 50. (a)
51 . (b)	52. (b)	5 3. (c)	54. (a)	55. (d)	5 6 . (c)	57. (c)	58. (b) \$	i9. (b) · 60 (a)
61 . (b)	62. (b)	63. (d)	64 . (d)	65. (b)	66 . (b)	67. (c)	68. (a) 1€	59. (a) 70. (b)
71. (b)	72. (d)	73. (a)			7 6 . (d)	77. (b)		79. (d) 80 : (b)
81. (c)	82. (b)	83. (a)			86. (b)	87. (c)	88. (b) 8	
91. (c)	92. (d)	93. (d)			9 6 . (b)	97. (b)		9. (c) 100. (d)
	102. (c)			105. (d) 10			108. (b) 10	
111. (b)				115. (d) 1:	7 0 . (9)	TTV. (C) .	r 79 * (D) 7 1	i9. (d) 120. (b)
441. (C)	144. (a)	123, (b) 1	<u>24.</u> (D)	<u>تحن (د)</u>				

Exercise-2: More Than One Correct Answers

1. (a, b)	2. (b, d)	3. (a, b, c)	4. (a, c)	5. (a, b) 👸	6. (a, b, d)
7. (c, d)	8. (a, d)	9. (b, c, d)	10. (a, b, c)	11. (a, b, c, d)	12. (b, d)
13. (a, c, d)	14. (a, b)	15. (a, b, c)	16. (a, c)	17, (a, d)	18. (a, b, d)
19. (a, b)	20. (a, b, c)	21. (b, c, d)	22. (a, b, d)	23; (a, c, d)	24. (a, b, c)
25. (a, b, c)	26. (a, b, c)	27. (a, b, c, d)	28. (a, b, c)	³ 29. (b, c, d)	30. (a, b, c)
31. (a, b)	32. (a, c, d)	33. (a, c)	34; (a, b, d)	35. (a, b, d) 🛬	36. (a, c, d)
37. (b, c, d)	38. (a, b, d)	39. (a, c, d)	40. (b, c, d)	41. (a, d)	42. (a, d)
43. (a, b, c)	44. (a, c)	45. (a, c)	14.3		>-

Exercise-3: Linked Comprehension Type

. (a)	2. (b)	ತೆ. (c)	4. (c)	5. (b)	6. (a)	7. (c)	8. (d)	9 (a)	10. (d)
13. (c)	12. (b)	·3 (p)	14. (c)	15. (d)					

Exercise-4: Matrix Match Type

1 (a)	→ Ř;	$(\bar{b}) \rightarrow \bar{P}, \bar{Q};$	$(c) \rightarrow P, Q, S;$	$(d) \rightarrow \tilde{P}, Q$
2 (a)	→ P, Q;	(b) $\rightarrow P, R$;	$(c) \rightarrow P, S;$	$(d) \rightarrow P, S$
3 (a)	→ Q, R;	(b) $\rightarrow Q, R$;	(c) → S;	$(d) \rightarrow P$
4. (a)	$\rightarrow P, R;$	(b) $\rightarrow Q$, S;	(c) $\rightarrow Q, R$;	$(d) \rightarrow P, S$
5. (a)		(b) $\rightarrow P, R$;	$(c) \rightarrow R, S_{:}$	$(d) \rightarrow P, R, S$

Exercise-5: Integer Answer Type Problems

		· (7)						7. (3)	8. (4)	9 (5)	1u (5)
7,	(A ·	10, B · 4,	C - 2)	12,	(5, A	, C, D <u>,</u> E,	G)				



Hydrocarbons (Alkane, Alkene and Alkyne)



EXERGISE() ONLY ONE CORRECT ANSWER

LEVEL

1.
$$B \leftarrow \frac{\text{Lindlar's}}{\text{Catalyst}} R - C = C - R \xrightarrow{\text{Na/NH}_3} A$$

A and B are geometrical isomers (R - CH - CH - R) of which type?

(a) A is trans, B is cis

- (b) A and B both are cis
- (c) A and B both are trans
- (d) A is cis, B is trans
- 2. Which is most easily dehydrohalogenated?



$$(II)$$
 $\left\langle \begin{array}{c} \\ \\ \end{array} \right\rangle$ $-C$

(a) l

(b) II

(c) III

- (d) all with same case
- 3. The relative stability of the compounds given below is in the order.

$$\begin{array}{c|c} CH_3 CH_3 \\ | & | \\ (I) CH_3 - C = C - CH_3 \end{array}$$

- $(III)CH_3-CH=CH_2$
- $(IV) CH_2 = CH_2$

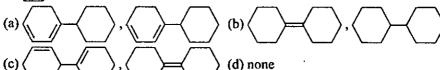
(a) 1 > 11 > 111 > 1V

(b) IV > III > II > II |

(c) I > III > II > IV

(q) |1| > 1 > 1 < 1

4. 2
$$\longrightarrow$$
 conc. $H_2SO_4 \longrightarrow A \longrightarrow B$, A and B are:



5.
$$CH_3$$
 CH_3 CH_3

The products are:

O
(a)
$$CH_3 - C - OH'(CH_3)_3C - COOH$$

O
(b) $CH_3 - C - CH_3$, $(CH_3)_3C - COOH$
O
(c) $CH_3 - C - CH_3$, $(CH_3)_3C - CHO$

- (d) None is correct
- 6. The compound formed when 2-butene is treated with hot alkaline KMnO₄ is:
 - (a) Acetaldehyde

(b) Acetic acid

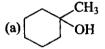
(c) CH₂OH · CH₂OH

- (d) CH₃ · CH₂ · CO · CH₃
- 7. Relative stability among conjugated dienes (i), alkenes (ii), alkynes (iii) towards electrophilic addition reaction is in the order:
 - (a) (i) > (ii) > (iii)

(b) (i) > (iii) > (ii)

(c) (iii) > (ii) > (i)

- (d)(ii) > (iii) > (i)
- $\xrightarrow{BD_3/THF}$ Product A, A is:



(b)

 CH_3 (c)

OH (d)

9. Arrange the following alkanols 1, 2 and 3 in order of their reactivity towards acid catalysed dehydration.

(a) 1 > 2 > 3

(b) 2 > 1 > 3

(c) 2 > 3 > 1

- (d) 3 > 2 > 1
- 10. An organic liquid (A), containing C, H and O with the boiling point 78°C and possessing a rather pleasant odour, or heating with concentrated H₂SO₄ gives a gaseous product (B) with the empirical formula CH2. (B) decolourises bromine water as well as alkaline KMnO₄ solution and takes up one mole of H₂ (per mole of B) in the presence of finely divided nickel at high temperature. (A) and (B) are:
 - (a) $C_2H_5OH_1C_2H_2$

(b) CH₃OH, C₂H₅

(c) C₂H₅OH, C₂H₄

(d) (CH₃)₂CHOH, C₃H₆

11.
$$\langle \underline{} \rangle + Br_2 \longrightarrow A$$

A will have configuration:

(a)
$$Br$$
 (b) Br (c) both true (d) none is true

12. CH₃CHO + HC≡CD $\rightarrow P$ (major), P is:

OD OH OH
$$(a) CH_3 - CH - C \equiv CH$$
 (b) $CH_3 - CH - C \equiv CD$

(c)
$$CH_3 - C - C = CD$$
 (d) None of these

13.
$$CH_3 \xrightarrow{\text{alc KOH}} \text{Product}$$

The product can be:

(a)
$$CH_3$$
 (b) CH_3 (c) CH_3 (d) CH_3 CH_3

14. Consider the following reaction.

$$CH_{3} \xrightarrow{C} CH_{2}CH_{3} \xrightarrow{base} CH_{3} \xrightarrow{CH_{3}} C=C \xrightarrow{CH_{3}} CH_{2}CH_{3}$$

$$CH_{3} \xrightarrow{C} CH_{2}CH_{3} \xrightarrow{CH_{3}} CH_{3}$$

$$CH_{3} \xrightarrow{C} CH_{3} \xrightarrow{C} CH_{3}$$

$$CH_{3} \xrightarrow{C} CH_{3} \xrightarrow{C} CH_{3}$$

Which of the following base will give the best yield of the alkene II as the major product?

(a)
$$CH_3O^-$$
 (b) $C_2H_5O^-$

(c)
$$(CH_3)_3CO$$
 (d) $(C_2H_5)_3CO^-$

- (a) 4, 5-Dimethyloct-4-ene
- (b) 3, 4-Dimethyloct-5-ene
- (c) 4, 5-Dimethyloct-5-ene
- (d) None

16.
$$CH_3$$
— CH — CH_2 — CH_3

What is not true regarding the products?

- (a) Product-I and II are position isomers
- (b) Product-I and II contains the same number of sp^3 and sp^2 carbon atoms
- (c) The yield of the product I and II is same
- (d) Reaction obeys Saytzeff rule

17. Which of the following is not true about geometrical isomer's? (a) They have different physical properties (b) The have different orientations in space (c) They have different connectivity of atoms or groups (d) They are non-interconvertible 18. 2-methyl propene is isomeric with But-1-ene. They can be distinguished by: (b) Ammonical AgNO₃ (a) Baeyer's reagent $(d) O_3, Zn/H_2O$ (c) Br₂ solution 19. Which of the following is the structure of propylene chlorohydrin? (c) CH₃ ---C---CH₃ (d) CH₃—CH—CH₂ | | | OH Cl 20. Which alkene on oxidation with acidic KMnO₄ gives only acetic acid? (b) $CH_3 - CH = CH - CH_3$ (a) $CH_3 = CH - CH_3$ (d) Pentene - 2 (c) Ethylene 21. Ethylene reacts with osmium tetroxide to form an osmic ester which on hydrolysis gives: (b) Glyoxal + Osmic acid (a) Ethyl alcohol + Osmic acid (d) Glycollic acid + H₂OsO₄ (c) Ethylene glycol + H₂OsO₄ 22. Diborane reacts with terminal alkenes to form trialkylboranes. These react with alkaline hydrogen peroxide to form: (b) Tertiary alcohols (a) Secondary alcohols (d) Primary alcohols (c) Isobutyl alcohol 23. Kharasch effect operates in which of the following? (b) $CH_3CH_2 - CH = CH_2 + HBr$ (a) $CH_3CH_2CH = CH_2 + HCl$ (c) $CH_3CH = CH - CH_3 + HBr$ (d) $CH_3CH_2CH = CH_2 + HI$ 24. A hydrocarbon X adds on one mole of hydrogen to gives another hydrocarbon and also decolourises bromine water. X reacts with KMnO4 in presence of acid to give two moles of the same carboxylic acid. The structure of X is: (a) $CH_3CH = CH \cdot CH_2CH_2CH_3$ (b) $CH_3CH_2CH = CHCH_2CH_3$ (c) $CH_3CH_2CH_2 - CH = CHCH_3$ (d) $CH_2 = CH - CH_2CH_2CH_3$ (b) CH₃CH₂CH = CHCH₂CH₃ 25. Identify Z in the sequence CH_3 — CH_2 —CH= CH_2 — CH_2 — CH_2 — CH_2 — CH_3 —CH(a) CH₃—CH—CH₂—O—CH₂—CH₃
CH₃

(b) CH₃—CH₂—CH -O—CH₂—CH₃
CH₃

(c)
$$CH_3 - (CH_2)_3 - O - CH_2 - CH_3$$

(d) $CH_3 - (CH_2)_4 - O - CH_3$

26.
$$CH_3$$
— $CH = CH_2 \xrightarrow{BD_3} product X, X is :$

(c)
$$CH_3 - CH - CH_3$$

(d) none is correct

27. $CH_2 = CH - CH = CH_2 \xrightarrow{CCl_3Br}$ product. The major product is:

(a) Br
$$-CH_2$$
 $-CH = CH - CH_2 - CCI_3$

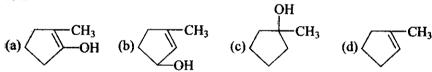
(b)
$$CH_2 = CH - CH - CH_2 - CCl_3$$

Br

(c)
$$CH_2 = CH - CH - CH_2 - Br$$

$$CCl_3$$

(d) none is correct



- 29. 2-Phenylpropene on acidic hydration gives:
 - (a) 2-Phenyl-2-propanol
- (b) 2-Phenyl-1-propanol
- (c) 3-Phenyl-1-propanol
- (d) 1-Phenyl-2-propanol
- 30. cis-2-Butene on reaction with Br₂ in CCl₄ produces mainly:
 - (a) 1-bromo-2-butene

- (b) 2, 3-dibromobutane
- (c) meso-2, 3-dibromobutane
- (d) (±) 2, 3-dibromobutane
- 31. Which of the following reaction will lead to the creation of two chiral centres in the product?

(a)
$$CH_3CH = CHCH_3 + Br_2 \xrightarrow{CCl_4}$$
 (b) $CH_3CH_2CH = CH_2 + Br_2 \xrightarrow{CCl_4}$

(b)
$$CH_3CH_2CH = CH_2 + Br_2 \xrightarrow{CCl_4}$$

(c)
$$CH_3CH = CHCH_3 + HBr \longrightarrow$$

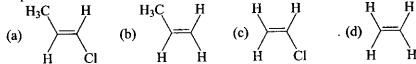
(c)
$$CH_3CH = CHCH_3 + HBr \longrightarrow (d) CH_3CH_2CH = CH_2 + HBr \longrightarrow$$

- 32. The reaction of ethylene with Br₂ in water in the presence of NaCl gives:
 - (a) 1, 2-dibromoethane

- (b) 2-bromoethanol
- (c) 1-bromo-2-chloroethane
- (d) all of these

- 33. A hydrocarbon C₈H₁₄ consumes only one mole of H₂ on catalytic hydrogenation. The hydrocarbon when heated with hot and concentrated alkaline KMnO₄ gives cyclohexanone and acetic acid (after acidification). The hydrocarbon is:
 - (a) 1-ethylcyclohexene

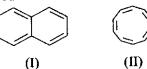
- (b) 1, 2-dimethylcyclohexene
- (c) ethylidenecyclohexane
- (d) cyclohexylethene
- 34. Dipole moment of which compound will be maximum?



- 35. Correct order of reactivity towards electrophilic addition reactions is:
 - (a) $CH_2 = CH_2 > CH_3 CH = CH_2 > (CH_3)_2 C = CH_2$
 - (b) $CH_2 = CH_2 > CH_3 CH = CH_2 < (CH_3)_2 C = CH_2$
 - $(c) CH_2 = CH_2 < (CH_3)_2 C = CH_2 < CH_3 CH = CH_2$
 - (d) CH_{3} — $CH = CH_{2} < CH_{2} = CH_{2} < (CH_{3})_{2}C = CH_{2}$
- 36. Rank the following in order of stability (lowest to highest).

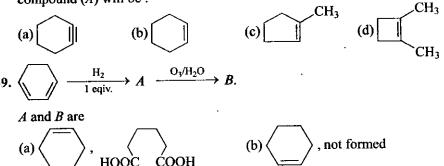


- (a) IV < II < III < I
- (b) IV < III < II < I(d) IV < II == III < I(c) I < III < II < IV
- 37. The following two compounds are:



- (a) identical
- (c) geometrical isomers

- (b) conformational isomers
- (d) structural isomers
- 38. Compound (A) on oxidation with OsO₄/NaIO₄ gives hexanedial. Structure of compound (A) will be:



(d) none is correct

40. Index of unsaturation (H-deficiency) of C₈H₁₀ is ... and if it has a six-membered ring, it can be:

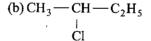
(b) 4, $\left\langle \begin{array}{c} \\ \\ \end{array} \right\rangle$ — CH=CH₂

(c) 4, \sim CH₂—CH

- (d) All correct
- 41. Which of the following yields But-2-ene on dehydration with conc. H₂So₄?
 - (a) 2-Methyl-2-butanol

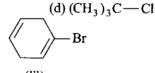
- (b) 2-Propanol
- (c) 2-Methyl-2-propanol
- (d) Secondary butyl alcohol
- **42.** An alcohol (A) on dehydration gives (B), which on Ozonolysis gives acetone and formaldehyde. (B) decolourises alkaline KMnO₄ solution but (A) does not. (A) and (B) are respectively:
 - (a) CH₃CH₂CH₂CH₂OH and CH₃CH₂CH=CH₂
 - (b) CH_2CH_2 —CH— CH_3 and CH_3 —CH=CH— CH_3 OH
 - (d) $(CH_3)_3C$ —OH and $(CH_3)_2C$ = CH_2
 - (c) CH_3 — CH_2 —CH— CH_3 and $(CH_3)_2C$ = CH_2 OH
- **43.** Which of the following compound undergoes dehydrochlorination most easily when treated with alcoholic KOH?

(a) CH₃ — CH — CH₂CI | CH₂



(c) CH₃—CH₂—CH₂Cl

44. \(\bigcup_{\text{Br}} \) Br



Which is most easily dehydrohalogenated?

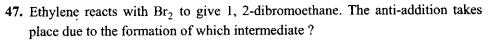
(a) I

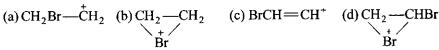
(b) II

(c) III

- (d) all with same case
- 45. Cyclohexene on reaction with OsO₄ followed by reaction with NaHSO₃ gives:
 - (a) cis-diol
- (b) trans-diol
- (c) epoxy
- (d) alcohol
- 46. Among the following incorrect statement (s) is/are:
 - (a) In alkens the boiling point increases with a rise in molecular mass.
 - (b) Branching in an alkane decreases the boiling point.
 - (c) Boiling point of an odd numbered carbon atoms alkane is lower than both of its even numbered neighbours.
 - (d) Melting point of an odd numbered carbon atoms alkane is lower than next even numbered neighbours.







- 48. Which of the following reactions will result in the formation of a chiral centre in the product?

(b)
$$CH_2 = CH_2 + HOBr \longrightarrow$$

(a)
$$CH_3CH = CH_2 + HBr \longrightarrow$$
 (b) $CH_2 = CH_2 + HOBr \longrightarrow$ (c) $CH_3CH_2CH = CH_2 + HBr \xrightarrow{H_2O_2}$ (d) $CH_3CH_2CH = CH_2 + HBr \longrightarrow$

49. One mole of a hydrocarbon on ozonolysis yields one mole of glyoxal and two moles of formaldehyde. The hydrocarbon is:

(a)
$$CH_2 = C - C = CH_2$$

 $CH_3 CH_3$

$$(b) CH2 = CH - CH = CH2$$

(c)
$$CH_2 = CH - CH_2 - CH = CH_2$$
 (d) $CH_3CH = C = CH_2$

- 50. A hydrocarbon (A) on chlorination gives (B), which on reacting with alcoholic KOH changes into another hydrocarbon (C). The latter decolorizes Baeyer's reagent and on ozonolysis forms formaldehyde only (A) is:
 - (a) Methane
- (b) Ethene
- (c) Ethane
- (d) Butane



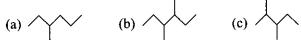
Alkane

- 1. The smallest alkane which can show optical isomerism possesses:
 - (a) 5 carbon

(b) 6 carbon

(c) 7 carbon

- (d) 8 carbon
- 2. Which of the following alkanes has a meso stereoisomers?









3. Among the following, the compound which has highest boiling point is:









ţ

- 4. Propane can be best prepared by the reaction:
 - (a) $CH_3CH_2I + CH_3I + Nai \xrightarrow{Et_2O}$
 - (b) $CH_3CH_2COONa + CH_3COONa \xrightarrow{H_2O}$ Electrolysis
 - (c) $CH_3CH_2Br + (CH_3)_2 CuLi \xrightarrow{Et_2O}$
 - (d) $CH_3CH_2CH_2COONa \xrightarrow{NaOH} CaO. A$



5.	Me ₃ CMgCl on reaction with D ₂ O produces:	
	(a) Me ₃ CD (b) Me ₃ COD	(c) $(CD_3)_3CD$ (d) $(CD_3)_3COD$
6.	Which of the following carboxylic acids undergoes decarboxylation most easily	
	on heating?	0
		Ĭ
	(a) CH ₃ CH ₂ COOH	(b) CH ₃ —C—COOH
	O O (C) CH ₃ —C—CH ₂ —C—OH	(q) C—OH
7.	$Br \longrightarrow Cl \xrightarrow{Na} Product,$	
	find the product:	
	(a) Cl———Cl	(b) Br——Br
	(c) Br———Cl	(d) (
8.	$ \begin{array}{c} & \text{Br} \\ & \text{dryether} \end{array} $ Product:	
	(a) Br MgBr	(b) $\frac{BrMg}{MgBr}$
	(c) CH_3 — CH = CH_2	(d) <u></u>
9.	Which of the following alkyl brome 2, 3-dimethyl butane by Wurtz reaction	
	Dr.	Br (b)
	(a) ABr	(b) <u></u>
	(c) Isobutyl bromide	(d) s-butyl bromide
10.	Which of the following methods of alka oxidation of alkanoate ion?	ane synthesis involves the electrochemical
	(a) Kolbe's method	(b) Wurtz method
	(c) Frankland method	(d) Corey-House method
H.	The reactivity of alkyl halides for Wur (a) $1^{\circ} > 2^{\circ} > 3^{\circ}$ (b) $3^{\circ} > 2^{\circ} > 1^{\circ}$	tz reaction is: (c) $2^{\circ} > 3^{\circ} > 1^{\circ}$ (d) $1^{\circ} > 3^{\circ} > 2^{\circ}$
12.	Which of the following is planar and ca	
	(a) (b) <u>(b)</u>	(c) (d)

13. Which of the following reactions has zero activation energy?

(a) $CH_4 + Cl^{\bullet} \longrightarrow CH_3 + HCl$ (b) $Cl \longrightarrow Cl \xrightarrow{hv} 2Cl^{\bullet}$

- (c) $CH_3^{\bullet} + {}^{\bullet}CH_3 \longrightarrow CH_3 \longrightarrow CH_3$
- (d) $CH_3^{\bullet} + Cl \longrightarrow CH_3 \longrightarrow CH_3 \longrightarrow Cl + Cl^{\bullet}$
- 14. Photochemical fluorination is explosive while iodination is too slow to occur. The reason for this is:
 - (a) bond dissociation energy of I_2 is minimum.
 - (b) formation of CH₃—F is most exothermic.
 - (c) formation of H—F is most exothermic while formation of HI is endothermic.
 - (d) F₂ has lower bond dissociation energy than Cl₂ and Br₂.
- 15. Which statement is incorrect about free radical halogenation of alkanes?
 - (a) The number of product molecules formed by one photon is very high
 - (b) If O₂ is added, initially the rate of reaction decreases, then it increases
 - (c) Inhibitors combine with free radical and terminate the chain reaction
 - (d) Presence of Ph—C—O—O—C—Ph inhibit the free radical reaction.
- 16. Which of the following is not the chain propagation step in the chlorination of alkane?
 - (a) $R^{\bullet} + SO_2Cl_2 \longrightarrow$
 - (b) ${}^{\bullet}SO_2Cl \longrightarrow SO_2 + Cl^{\bullet}$
 - (c) $Cl^{\bullet} + R H \longrightarrow$
 - (d) $R \longrightarrow O \longrightarrow R + 2R \longrightarrow 2ROH + 2R^{\bullet}$
- 17. An alkane cannot be chlorinated by using which of the following reagents?
 - (a) Cl₂/hv

۱.

(c) P > Q > S > R

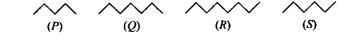
- (b) HCl
- (c) SO₂Cl₂

(d) S > R > Q > P

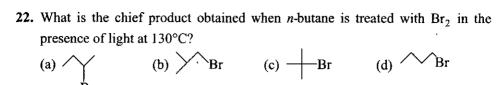
- (d) t-Bu-O-Cl
- 18. The correct order of heat of combustion of the following hydrocarbon is:

Pent-1-ene Pentane neopentane isopentane (P) (Q) (R) (S) (S) (A) P > Q > R > S (B) (

- 19. Formation of free radical takes place with absorption of minimum energy in the formation of:
 - (a) \nearrow \bowtie (b) \nearrow \bowtie (c) \bowtie (d) \bowtie Br
- 20. Formation of free radical is easiest in:
 - (a) \wedge_{Cl} (b) \wedge_{Br} (c) \wedge_{F} (d) \wedge_{I}
- 21. The correct order of relative density of following alkanes is:



(a) P > S > Q > R (b) R > S > Q > P (c) R > Q > S > P (d) S > R > Q > P



- 23. The number of possible enantiomeric pairs that can be produced during monochlorination of 2-methyl butane is:
 - (b) 4 (a) 3 (c) 2 (d) 1
- 24. For the given reaction how many products will obtain (all isomers)?

- 25. How many total products will be obtained by monochlorination of 2-methyl butane and how many can be separated by fractional distillation?
- (a) 6, 4 $\xrightarrow{\text{Br}_2/\text{hv}} \text{Products},$

How many monobrominated products will be obtained by above reaction? (c) 5

27.
$$H \xrightarrow{H} D \xrightarrow{Br_2/hv} Products:$$

$$C_2H_5 \xrightarrow{C} H_3 \xrightarrow{C_2/hv} Products:$$

(b) 4

(a) 6

(a)
$$H \longrightarrow D$$

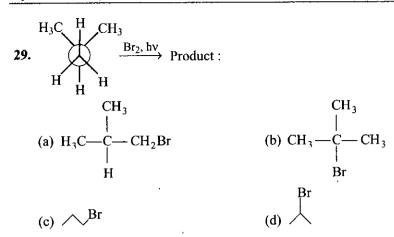
 $H_3C \longrightarrow Br$
 C_2H_5
(b) $H \longrightarrow D$
 C_2H_5
(c) Both (a) and (b) (d) None of these

28.
$$H_3C$$
— C — C H $+CCl_4$ $\xrightarrow{R_2O_2}$ Product: CH_3 CH_3

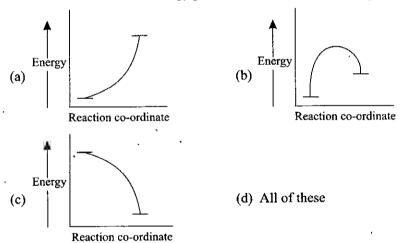
(c) Both (a) and (b)

(d) None of these





- 30. How many alkane of molecular weight 100 are chiral?
 - (a) 1
- (b) 2
- (c) 3
- (d) 4
- 31. Which one is the correct energy profile for $Cl^{\bullet} + Cl^{\bullet} \longrightarrow Cl_2$?



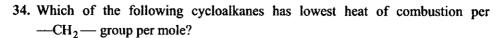
- 32. Which of the following is the correct statement regarding relative acidic character of cyclopropane and propane?
 - (a) Cyclopropane is more acidic than propane
 - (b) Propane is more acidic than cyclopropane
 - (c) Both are equally acidic
 - (d) Both are neutral

33. Ph—CH—CH₂—CH₃
$$\xrightarrow{\text{Cl}_2}$$
 Products $\xrightarrow{\text{Fractional}}$ Fractions,

CH₂

No. of products and no. of fractions are respectively:

- (a) 6, 5
- (b) 6, 4
- (c) 5, 4
- (d) 6, 3





- 35. Which of the following alkyl halides is not suitable for Corey-House synthesis of alkanes?
 - (a) CH_3I (b) \nearrow_{Br} (c) \nearrow_I (d) \nearrow_{Br}
- 36. The relative reactivity of 1°H, 2°H and 3°H in bromination reaction has been found to be 1:82:1600 respectively. In the reaction,

$$+ Br_2 \xrightarrow{hv} \times Br + Br$$
(A) (B)

The percentage yield of (A) and (B) are expected to be:

(a) 99.4%, 0.6%

(b) 50%, 50%

(c) 0.6%, 99.4%

- (d) 80%, 20%
- 37. The relative reactivity of 1°, 2° and 3° hydrogens in chlorination reaction has been found to be 1:3.8:5. In the reaction,

$$\begin{array}{c|c}
 & Cl_2 \\
\hline
 & hv
\end{array}$$

$$\begin{array}{c|c}
 & + \\
 & Cl
\end{array}$$

$$\begin{array}{c|c}
 & + \\
 & Cl
\end{array}$$

$$\begin{array}{c|c}
 & + \\
 & Cl
\end{array}$$

$$\begin{array}{c|c}
 & Cl
\end{array}$$

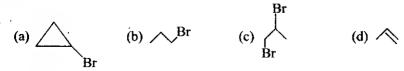
The ratio of the amount of the product (A), (B), (C) and (D) is expected to be:

(a) 1:3.8:5:1

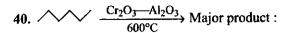
(b) 3:7.6:5:6

(c) 3:7.6:5:3

- (d) 1:7.6:5:1
- 38. Which of the following is the free radical chain reaction?
 - (a) $2CH_3I + 2Na \longrightarrow CH_3 CH_3 + 2NaI$
 - (b) $CH_4 + Cl_2 \xrightarrow{hv} CH_3Cl + HCl$
 - (c) $2CH_3COONa \xrightarrow{\Delta} CH_3 CH_3 + 2CO_2 + 2NaOH + H_2$
 - (d) All of the above
- 39. $+ HBr \longrightarrow Product :$









41.
$$Cr_2O_3 - Al_2O_3 \longrightarrow Major product$$
:





42. Consider the following reaction:

Identify structure of (X) among following:

(a)
$$CH_2$$
 (b) D (c) D

43. Br
$$\xrightarrow{\text{Na/EtOH}}$$
 Product:

(d)
$$H_2C = C = CH_2$$

44. The bond dissociation energy of the C-H bond for the compound

$$H_3C-H$$
 H_3C-CH_2-H $H_2C-CH-CH_2-H$

$$(P) \qquad (Q) \qquad (R) \qquad (S)$$
decreases in the order:

(a) P > Q > R > S

(b) S > R > O > P

(c) S > P > Q > R

(d) O > P > S > R

45. Which of the following carboxylic acids is difficult to decarboxylate?



OH (b)
$$\stackrel{\text{HO}}{\longrightarrow} OH$$
 (c) $\stackrel{\text{OH}}{\longrightarrow} OH$ (d) $O_2N \stackrel{\text{OH}}{\longrightarrow} OH$

46. The method of estimation of active hydrogen in a compound by reaction with CH₃MgI is known as:

- (a) Zerewitinoff method
- (b) Hinsberg method

(c) Zeisel method

(d) Victor Meyer's method

47.
$$\longrightarrow$$
 0 $\xrightarrow{\text{HS}^{\text{SH}}}$ $\xrightarrow{\text{H}_2/\text{Ni}}$

The end products of the reactions are:

- (a) \rightarrow SH and \rightarrow SH
- (b) \searrow —S—CH₂—CH₂—SH

(c) \times_{S}^{S} and H_2O

- (d) \rightarrow and \rightarrow SH
- **48.** Consider the following reaction:

The major products formed in this reaction are:

(c)
$$++$$
 and \times OH

(d) No reaction

Find out number of monochlorinated products (including stereoisomers) which are possible in the above reaction:

(a) 2

- (b) 3
- (c) 4
- (d) 5

50.
$$CH_2 \xrightarrow{H_2, Pd}$$

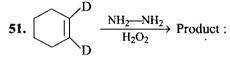
Products of the above reaction will be:

(a) racemic mixture

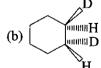
(b) diastereomers

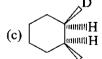
(c) meso

(d) structural isomer

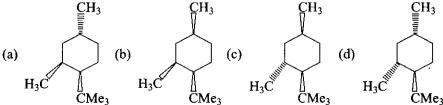








- (d) Both (b) and (c)
- 52. Which one of the following has lowest heat of combustion?





53. On catalytic reduction with H₂/Pt how many alkenes will give *n*-butane?

(c) 3

54. $(a, 1) \qquad (b) 2$ $H_3C \qquad D \qquad H_2/N_1$

Product of above reaction will be:

- (a) racemic mixture
- (c) meso

- (b) diastereomers
- (d) constitutional isomers

(d) 4

55. $D = C D \xrightarrow{H_2/N_i} C = C$

Product of above reaction will be:

- (a) racemic mixture
- (c) meso

- (b) diastereomers
- (d) constitutional isomers

56. $\frac{H_2(1 \text{ Mole})}{\Delta} \text{ Product}:$

- (a)
- (b)
- (c)
- (d) None of these

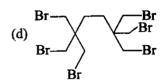
57. $\frac{H_2(1 \text{ Mole})}{\Delta} \text{ Product}:$

- (a) (a)
- (b)
- (c) (l)
- (d) None of these

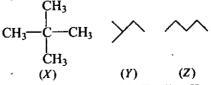
58. $C \xrightarrow{\text{CH}_2 - \text{Br}} \xrightarrow{\text{Na/Ether}} \text{Major product}:$

(p)

(c) Br



59. Arrange the following alkanes in decreasing order of their heat of combustion:



- (a) X > Y > Z
- (b) Z > X > Y
- (c) Z > Y > X
- (d) X > Z > Y

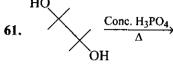
Alkene and Alkyne

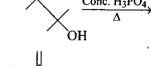
- 60. Which of the following is the major product when 1-butanol is heated with concentrated H2SO4?
 - (a) '1-butene

(b) Cis-2-butene

(c) Trans-2-butene

(d) All of these





62. In the reaction

$$\begin{array}{c}
C_2H_5O^{\ominus} \\
\hline
C_2H_5OH
\end{array}$$

The major product obtained is:

(b)
$$\searrow^{OC_2H}$$

 $\xrightarrow{\text{Conc. H}_2\text{SO}_4}$ Major product :

- (b) (c) (c)
- (d) None of these

 \rightarrow CH₂—OH $\xrightarrow{\text{Conc. H}_3\text{PO}_4}$ Major product :

- - \rightarrow CH₂ (b) \rightarrow CH₃ (c)

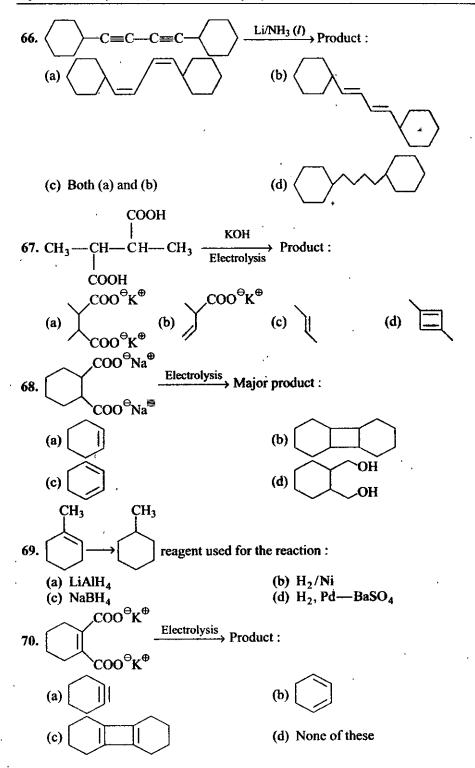
65. The major product of the following reaction is:

$$Br \longrightarrow Cl \xrightarrow{Na/Ether} \xrightarrow{Br_2, hv} \xrightarrow{Alc. KOH}$$









Which reagent will be used for the above conversion?

(a) Na/Liq. NH₃

(b) H₂, Pd—CaCO₃

(d) None of these

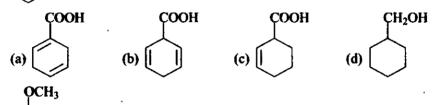
(c) Li, Ph--NH₂

COOH

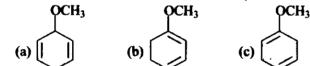
(d) H₂, Pt



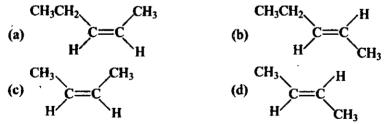
Li, Liq. NH₃ Major product:



73. Na, Liq. NH₃ Major product :



74. Which of the following has zero dipole moment?



75. Which of the following is correct order of stability of alkene?

٠

76. Which of the following alkenes is most reactive towards electrophilic addition reaction?

(a)
$$H_2C = CH_2$$

(b)
$$CH_3$$
— CH = CH_2

(c)
$$H_3C$$
 = CH_2

77. Propene reacts with Br₂ to give 1, 2-dibromopropane. The anti-addition takes place due to the formation of intermediate:

(a)
$$CH_3$$
— CH — CH_2
(b) H_3C — CH — CH

(c) H_3C — CH — CH_2 — Br
(d) None of these

(c)
$$H_3C$$
— CH — CH_2 — B_1

78. Consider the following reaction:

$$CH_3$$
 $|$
 $H_3C-C-CH=CH_2+HCI\longrightarrow$
 CH_3

The major product obtained in the reaction is:

79. Which of the following reactions is expected to give a fairly good yield of $(CH_3)_3C$ —CH= CH_2 ?

(a)
$$H_3C$$
— C — CH — CH_3 (b) H_3C — C — CH — CH_3 CH

80.
$$O_2N$$
—CH—CH—CH₃ \xrightarrow{HCl} Major product :

(a)
$$O_2N$$
—CH₂—CH—CH₃ (b) O_2N —CH—CH₂—CH₃

(c)
$$O_2N$$
— CH_2 — CH_2 — CH_3 (d) None of these

81.
$$H_3C - O - CH = CH - CH_3 \xrightarrow{HBr} Major product :$$

- (c) Both (a) and (b) in same amount
- (d) None of the above

82.
$$H_2C = CH - C = CH + HCI \longrightarrow X$$
; 'X' is:

83. Arrange the following reactions in decreasing order of electrophilic addition reaction:

(a) P > O > R

(b) $Q > R > \hat{P}$

(c) R > Q > P

(d) P = Q = R

84. / HBr (1 Mole) Major product :

$$\begin{array}{ccc} & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & &$$

(d) None of these

85. The reactivity of alkene

towards hydrogen is:

(a)
$$X > Y > Z$$
 (b) $Y > X > Z$ (c) $Z > X > Y$ (d) $Y > Z > X$

(b)
$$Y > X > Z$$

(c)
$$Z > X > Y$$

(d)
$$Y > Z > X$$

86.
$$H_3C$$
— C = C
 H
 CH_3
 H_2 , Pd — $BaSO_4$
 $Isoquinoline$
 H
 CH_3

- (a) an optically active compound
- (b) an optically inactive compound
- (c) a racemic mixture
- (d) a diastereomeric mixture

87. 2 Conc.
$$H_2SO_4 \rightarrow A \xrightarrow{Pt/H_2} B$$

A and B respectively are:

BR.
$$B \leftarrow \frac{BH_3 \cdot THF}{H_2O_2/OH}$$
 $CH_2 \xrightarrow{Hg(OAc)_2, H_2O} A$

A and B are respectively:

(a)
$$CH_3$$
 both (b) CH_2OH both (c) CH_2OH and CH_2

89. What reagent is needed to accomplish the following synthesis?

$$\overset{H_3C}{\longleftarrow} \overset{CH_3}{\longleftarrow} \overset{H_3C}{\longrightarrow} \overset{CH_3}{\longleftarrow}$$

- (a) H₃[⊕]O
- (b) $KMnO_4$, OH (c) O_3 , Zn/H_2O (d) Ph— CO_3H

90. Which compound will yield 5-keto-2-methyl hexanal upon treatment with O₃?

(a)
$$CH_3$$
 (b) CH_3 (c) CH_3 (d) CH_3 (d) CH_3

 $\xrightarrow{\text{Conc. H}_3\text{PO}_4} \text{Major product}:$

 $C \longrightarrow CH_3 \xrightarrow{H_2, Pd \longrightarrow BaSO_4} Major product :$

- (d) None of these

93. H_3C —CH= CH_2 + HCl $\xrightarrow{Peroxide}$ Product, the intermediate of reaction is:

(a) CH₃—CH—CH₃

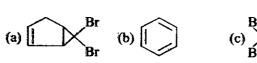
(b) CH₃—CH₂—CH₂

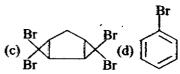
(c) 'CH₃---CH---CH₃

(d) CH_3 — CH_2 — $\overset{\oplus}{C}H_2$

CHBr₃ + Alc. KOH

→ Major product:





$$\xrightarrow{\text{Alc. KOH}} Y$$

$$\xrightarrow{\text{NBS}} X \xrightarrow{\text{Alc. KOH}} Y \xrightarrow{\text{Hg (OAc)}_2, \text{ Ph--CH}_2\text{OH}} Z; `Z' \text{ is :}$$

QCH₂---Ph





(d) No reaction

98. Fastest rate of electrophilic addition takes place in :

(b)
$$O_2N$$
— $\langle V \rangle$ — CH = CH_2

(c)
$$H_3C$$
 $CH = CH_2$
(d) $CH = CH_2$

99. Which of the following will be the correct product of reaction?

(a)
$$OH$$

(b) OH

(c) OH

(d) OH

100. Give the reagent that would best accomplish the following reaction:

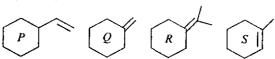
(a) Cold KMnO₄

(b) CF_3CO_3H , H^{\oplus}/H_2O

(c) O₃, Zn—H₂O

(d) KMnO₄, Δ , $\stackrel{\Theta}{O}$ H

101. Arrange the following alkenes in increasing order of their enthalpy of hydrogenation $(--\Delta H)$:



- (a) R < S < Q < P (b) R < S < P < Q (c) P < Q < R < S (d) P < Q < S < R
- 102. Which reagent is best to perform the following transformation?

$$\bigcirc \longrightarrow \bigcirc$$

- (a) HBr, NaOH
- (b) HBr, R—O—O—R, hv; Me₃COK^{\oplus}
- (c) BH_3 . THF, NaOH— H_2O_2
- (d) Br₂, NaOH

103. Choose the reaction sequence that would best accomplish the preparation of 2-methylcyclohexanol:

(a)
$$H_2O, H_2SO_4$$
 (b) $Hg(OAc)_2, H_2O$ $NaBH_4, OH$ (c) $BH_3 \cdot THF$ $H_2O_2, NaOH$ (d) $BH_3 \cdot THF$ $H_2O, NaOH$

104. Give the major product of the following reaction

106. Give the major product of following reaction

$$(a) \xrightarrow{Br_2/CCl_4} Major product :$$

$$(b) \xrightarrow{Br} Br$$

$$(c) \xrightarrow{Br} OH$$

$$(d) \xrightarrow{Br} OH$$

107. Which of the following products is not formed in following reaction?

Ph
$$CH_2$$
—Cl Ph CH_2 —OH

(c) CH_3 CH

113. Which of the following reagents will bring about following transformations?

(a)
$$Cl_2/H_2O$$
 (b) PBr_3/H^{\oplus}
(c) $Hg(OAc)_2$, $H_2O/NaBH_4$, OH (d) BH_3 . THF , H_2O_2/OH

114. Which molecule will give following dicarboxylic acid upon treatment with acidic solution of KMnO₄?

115. Which of the following reagents would best accomplish the following transformations?

- (a) Excess B₂H₆; NaOH/H₂O₂ followed by OsO₄
- (b) Excess Hg(OAc)₂/H₂O; NaBH₄, OH followed by conc. H₂SO₄, Δ
- (c) O₃, Zn/H₂O followed by Hg(OAc)₂/H₂O; NaBH₄, OH
- (d) OsO4; NaHSO3 followed by NaOH
- 116. What is the product of the following sequence of reaction?

117. Which would produce chiral molecule after treatment with Lindlar catalyst?

118. Which of the following compounds was starting material for the oxidation shown below?

Compound
$$\xrightarrow{\text{KMnO}_4/\text{H}^{\oplus}}$$
 $\xrightarrow{\text{OO}}$ $\xrightarrow{\text{OO}}$ $\xrightarrow{\text{OH}}$ $+$ $\xrightarrow{\text{CO}_2}$ $\xrightarrow{\text{OO}}$ $\xrightarrow{\text{OH}}$ $\xrightarrow{\text{OO}}$ $\xrightarrow{\text$

119. How is the following transformation best carried out?

(a) OsO₄; NaHSO₃

(b) H_2SO_4/H_2O

(c) HgSO₄/H₂SO₄

(d) HIO₄



120. The product of following reaction can be best described as:

(a) a racemic mixture

- (b) a single enantiomer
- (c) a pair of diastereomers
- (d) an achiral molecule

121.
$$\nearrow \nearrow \longrightarrow X \xrightarrow{\text{HBr}} Y \xrightarrow{\text{Mg}} Z; Z \text{ is } :$$









122. Product of following reaction can be best described as:

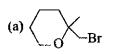
- (a) meso product
- (b) a pair of enantiomers
- (c) structural isomer
- (d) a pair of diastereomers
- 123. Which of the following reactions results in the formation of a pair of diastereomers?

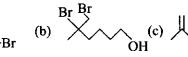
(a)
$$H_3C$$
 H_{Br} HBr

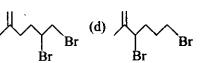
(c)
$$H_3C$$
 H_3C
 H_3C
 H_3C
 H_2O_2 , hy

(d)

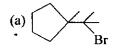
124.
$$\longrightarrow$$
 OH $\xrightarrow{\text{Br}_2/\text{CS}_2}$ Major product :

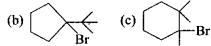


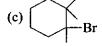




HBr → Major product:











127.
$$\xrightarrow{\text{H}_2, (1 \text{ Mole})} \text{Product}$$

Stereochemistry of the product are:

- (a) diastereomers
- (b) meso
- (c) racemic mixture
- (d) pure enantiomers

129.
$$COOH \xrightarrow{I_2/NaHCO_3} Major product :$$

130. Ph—CH=CH—Ph
$$\xrightarrow{Cl_2}$$
 X $\xrightarrow{2NaNH_2}$ Y $\xrightarrow{H_2, Pd-CaCO_3}$ Z

Identify product (Z) of the reaction.

Ph H
(a) C=C
Ph
Ph
(b) H
(c) C=CH₂
Ph
(d) Ph—C=C—Ph

131. $\xrightarrow{Excess CF_3CO_3H}$

(a) O (b) O (c) O (d) O (33.
$$\nearrow$$
 OH Cl_2 \searrow NaHCO₃

(a)
$$HO$$
 (b) CI (c) CI OH (d) OH

CH₃
$$\xrightarrow{\text{CSO}_4}$$
 $\xrightarrow{\text{NaHSO}_4}$

(a)
$$CH_3$$
 CH_3 $CH_$

135. Which of the following is major product of reaction shown below?

$$\begin{array}{c} CH_{3} \\ Cl_{2} \\ CH_{3}OH \end{array}$$

$$\begin{array}{c} CH_{3} \\ CH_{4} \\ CH_{5} \\ CH_{5$$

136. A triene treated with ozone followed by CH₃—S—CH₃ to give following three products. What is the structure of triene?

137. If the following compound is treated with Pd/C in excess of H₂ gas, how many stereoisomers of the product will be obtained?

(a) 1 (b) 2 (c) 3 (d) 4

138.

CH₃
$$\xrightarrow{CH_3}$$
 $\xrightarrow{H_2, Ni}$ Product:

(a) \xrightarrow{D} \xrightarrow{H} $\xrightarrow{CH_3}$ $\xrightarrow{CH_$

140. An organic compound C_4H_6 on reductive ozonolysis gives HCHO, CO_2 and CH_3CHO . Find structure of compound.

(a)
$$H_2C = CH - CH = CH_2$$

(b)
$$CH_3$$
— CH = C = CH_2

(d)
$$H_3C$$
— C = C — CH_3

141.
$$\xrightarrow{\text{HCHO, H}^{\oplus}}$$
 Major product :

(a)
$$OH$$
 (b) OH (c) OH (d) OH OH
$$OH$$

Reagents (A) and (B) in above reaction:

- (a) CF₃CO₃H, H₂O₂
- (b) CF₃CO₃H, HIO₄
- (c) CF₃CO₃H; O₃, Me₂S
- (d) All of the above

143. Which reaction will occur at the fastest rate?

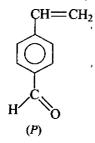
144.
$$OH \xrightarrow{1. \text{Hg } (OAc)_2} Major \text{ product } :$$

(a)
$$O$$
 (b) O (c) O (d) O

· Comment on optical nature of product.

- (a) Racemic mixture
- (c) Diastereomer

- (b) Enantiomer
- (d) Optically inactive
- 146. Arrange the following compounds in decreasing order of rate of electrophilic addition reaction.

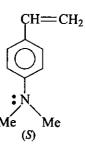


CH=CH₂

CH=CH₃

(Q)

 $CH = CH_2$ CH_3 (R)



- (a) Q > S > P > R
- (b) S > Q > R > P
- (c) P > Q > R > S
- (d) R > Q > S > PQCH₃

 $\xrightarrow{\text{Na, NH}_3(I)} X \xrightarrow{\text{O}_3, \text{Me}_2S} Y + Z$

Identify products Y and Z.

(d) Both are

148.
$$(1 \text{ Mole})$$
 Major product :

HO

149.
$$\nearrow$$
 $\stackrel{I}{\longrightarrow}$ $\stackrel{HI \text{ (excess)}}{\bigcirc CCl_4}$ $\stackrel{I}{\longrightarrow}$ $\stackrel{I}{$

150. What is the final product of the following reaction?

151. Which of the following is not formed in given reaction?

(a)
$$(b)$$
 (c) (d) (d) (d) (d)

152. Which of the following is major product?

153. Select the reagent for following transformation:

$$-$$
C \equiv C $-$ H \longrightarrow OH

- (a) H₂-Pd, HCHO, H₂SO₄
- (b) H_2 , Pd-BaSO₄; $Hg(OAc)_2$, H_2O , NaBH₄, $\overset{\Theta}{O}H$
- (c) BH_3 , H_2O_2 , OH, Pd-C
- (d) Hg⁺², H₂SO₄, H₂, Pd-BaSO₄

154. Select the starting material for following reaction:

?
$$\xrightarrow{\text{Hg (OAc)}_2, \text{H}_2\text{O}}$$
 OH

NaBH₄, OH

(a) (b) (c) (d) Both (a) and (b)

155. Select the best starting material for the following reaction:

156. Choose the best reagent to carry out the following transformations:

$$H_3C-C \equiv C-H \longrightarrow H$$

- (a) Lindlar catalyst; NaNH2/NH3 (1), 1-bromopropane
- (b) NaNH₂/NH₃ (l), 1-bromopropane; Lindlar catalyst
- (c) NaNH₂/NH₃(*l*), 1-bromopropane; Li/NH₃(*l*)
- (d) All of the above

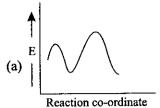
157. Which of the following will be most reactive in the addition reaction with HBr?

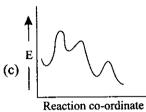
158. Consider the following rearrangement reaction.

$$\xrightarrow{\text{HBr}} \xrightarrow{\text{HBr}} \xrightarrow{\text{Br}^{\Theta}} \xrightarrow{\text{Br}^{\Theta}}$$

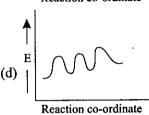


Which of the following reaction co-ordinates best represents overall reaction?





(b) | Reaction co-ordinate



159. Compound $(X) \xrightarrow{O_3, Zn-H_2O} H + H$

Find the structure of (X).

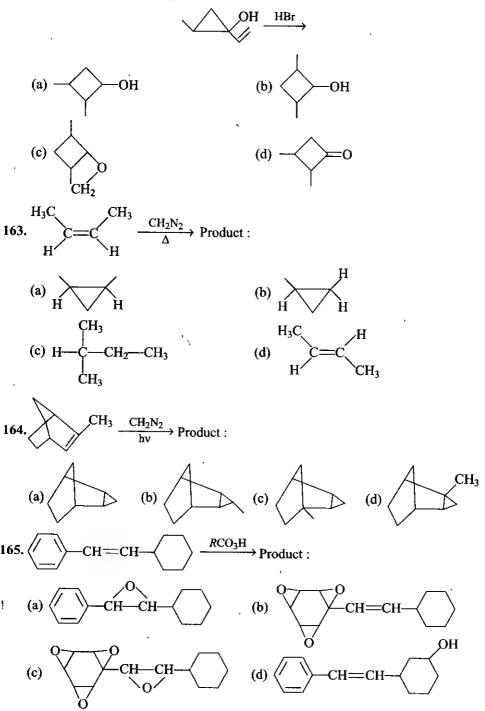
160. HCl Major product :

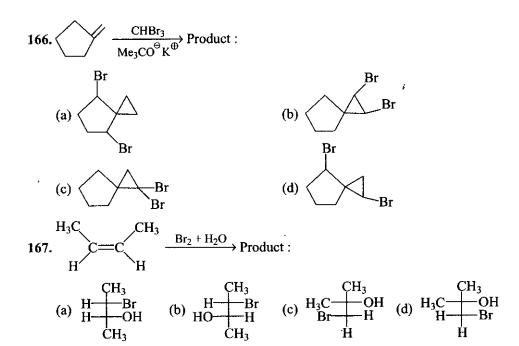
161. \sim CH=CH- \sim Major product :

(c)
$$\sim$$
 CH=CH- \sim

(d) Both (a) and (b)

162. The product of following reaction can be:





168. Rates of hydration of the following alkenes are:

$$CH_3$$
— CH = CH_2 F — CH = CH_2 CH_3 — CH = CH_2

$$(Q)$$

$$CH$$
= CH_2

$$(S)$$

(a)
$$P > Q > R > S$$

(b)
$$S > R > Q > P$$

(c)
$$P > S > R > Q$$

(d)
$$R > S > P > Q$$

169. Rates of hydrohalogenation of the following alkenes are:

CH=CH—CH—CH—CH—CH—CH—CH—CH—CH3

$$(P)$$
 (Q)
 (Q)

(a)
$$P > Q > R > S$$

(c)
$$Q > P > S > R$$

(d)
$$P > Q > S > R$$

170. Rates of addition of Cl₂/H₂O of the following alkenes are:

170. Rates of addition of
$$CI_2/H_2O$$
 of the following alkenes are:

$$CH_2 = CH_2 \quad CH_2 = CH - C - H \quad CH_3 - CH_2 - CH - CH_2 \quad CH_3 - C - CH_2$$

$$(a) \quad S > R > P > Q \quad (b) \quad S > P > Q > R$$

$$(c) \quad P > Q > R > S \quad (d) \quad P > Q > S > R$$

171. $3CH_3 - C = CH \xrightarrow{Red hot} Cu \text{ tube}$

$$CH_3 \quad CH_3 \quad CH_3 \quad CH_3$$

(c)

172.
$$CH_3CH_2C = CH \xrightarrow{NaNH_2/NH_3(l)} \xrightarrow{CH_3CH_2Br} \xrightarrow{Li, NH_3(l)}$$

(c)
$$CH_3CH_2$$
 $C=C$ CH_2C

$$(d) \begin{array}{c} CH_3CH_2 \\ H \end{array} C = C \begin{array}{c} CH_2CH_3 \\ H \end{array}$$

ĊH₃

 CH_3

173.
$$CH_3CH_2CH_2$$
— C — $H + CH_3$ — C = CH Na, $NH_3(!)$

174. The products of the following I and II sequences are related as:

$$CH_{3}-C \equiv C-CH_{3} \xrightarrow{(II)} \xrightarrow{\begin{array}{c} H_{2}, Pd-BaSO_{4} \\ Br_{2}/CCI_{4} \\ \end{array}} \xrightarrow{(II)} \xrightarrow{\begin{array}{c} Br_{2}/CCI_{4} \\ H_{2}, Pd \end{array}}$$

(a) diastereomers

(b) identical

(c) enantiomers

(d) geometrical isomers

- 177. Which is the most suitable reagent among the following to distinguish compound
 - (3) from rest of the compound?
 - $1.CH_3$ —C=C— CH_3
 - 2. CH₃—CH₂—CH₂—CH₃
 - 3. CH₃CH₂—C≡CH
 - 4. CH₃—CH=CH₂
 - (a) Br₂ in CCl₄

(b) Br₂ in CH₃COOH

(c) Alk. KMnO₄

- (d) AgNO₃/NH₄OH
- 178. Two gases P and Q both decolourise aqueous bromine but only one of them gives white ppt with Tollen's reagent. P and Q are likely to be:
 - (a) $H_2C = CH_2$ and $CH_3 = C = C CH_3$
 - (b) $HC \equiv CH$ and $CH_3 CH_2 C \equiv CH$
 - (c) HC≡CH and CH₃—C≡CH
 - (d) CH_3 — CH_2 — $C\equiv CH$ and CH_3 — $C\equiv C$ — CH_3

Ę

179.
$$\longrightarrow H_{3}, THF$$

(a) $\longrightarrow OH$

(b) $\longrightarrow OH$

(c) $\longrightarrow OH$

- **180.** Which of the following hydrocarbons should be choosen as a starting material to prepare 3-hexanone by the hydration?
 - (a) \nearrow $C \equiv C CH_3$

(b) **CH**

(c) **////**

(d) _{\(\lambda \) \\ \(\lambda \) \

Br
$$CH$$
— CH

Br CH — CH

Br CH

- 182. Among the following compounds which one cannot decolourise alkaline KMnO₄ solution?
 - (a) HC≡CH O

(b) CH₃—CH₂—OH

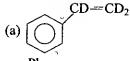
(c) CH₃—C—H

(d) CH_3 — CH_3

183.
$$C = CH$$

$$\xrightarrow{\text{NaNH}_2} A \xrightarrow{\text{D}_2} Pd\text{-BaSO}_4 Baso} A$$

End product B is:



(c)
$$D = C$$

The major product is:

(b) Ph—C=C—Ph

(c) Ph—C≡CH

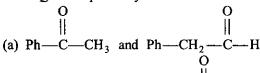
(d) None of these

185. Ph—C
$$\Longrightarrow$$
CH— $(Sia)_2, BH \to P$

$$H_2O_2, OH$$

$$Hg^{+2}, H_2SO_4 \to Q$$

P and Q are respectively:



- (c) Ph—C— CH_3 and Ph—C— CH_3
- (d) Ph—CH₂—CHO and Ph—CH₂—CHO

186. CH₃—C=C—CH₃
$$\xrightarrow{\text{BH}_3.\text{THF}}$$
 Major product :

- 187. Which of the following molecules is not linear?
 - (a) O = C = C = C = O

(b) $H_2C=C=O$

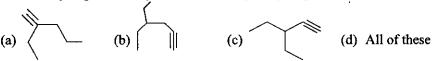
(c) HC≡C—C≡CH

- (d) HC≡CH
- 188. Which of the following reagents can be distinguish propyne from propene?
 - (a) Br_2 , CCl_4

(b) Dilute KMnO₄

(c) Conc. H₂SO₄

- (d) AgNO₃ in NH₄OH
- 189. Which alkyne gives 3-ethylhexane on catalytic hydrogenation?



190. Which reaction yields the major product shown?

(a)
$$\longrightarrow \frac{H_2O}{H_2SO_4}$$
 OH
(b) $\longrightarrow \frac{Hg^{+2}, H_2O}{H_2SO_4}$ O
(c) $\longrightarrow \frac{2HBr}{G}$ Br
(d) $\longrightarrow \frac{Cl_2}{CH_2Cl_2}$

(a) CH₃—CH₂—O—CH₂—CH₂—OH
OH

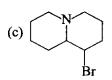
(c)
$$CH_3$$
— CH_2 — OH and HO — CH = CH_2

 $\underbrace{I_2, NaHCO_3}$ Major product :

198.
$$\xrightarrow{\text{HCl}}$$
 Major product :

199. Which of the following compounds produces-1, 5-cyclooctanedione or ozonolysis?

 $\xrightarrow{\text{Br}_2/\text{CCl}_4} \text{Major product}:$



(d) All of these

201.
$$\xrightarrow{H^{\oplus}}$$
 Major product :

HCl (1 Mole) → Major product :

 $+ \operatorname{Br}_2(1 \operatorname{Mole}) \xrightarrow{\operatorname{CCl}_4} \operatorname{Major product}:$

204.
$$H_2C = CH_2 + CO + H_2 \xrightarrow{Co_2(Co)_8} \frac{Co_2(Co)_8}{100^{\circ}C, \text{ High P}}$$

 CH_3

CH₃

 $C = CH_2 \xrightarrow{HOCl} Major product :$ 205. CH3

206.
$$+ \longrightarrow H \xrightarrow{\Delta} Major product$$
:

(a)

211.
$$OH \xrightarrow{\Delta} Major \text{ product}:$$

212. $+ CH_2I_2 \xrightarrow{Zn, \Delta} Major product :$

QCH₃

$$\begin{array}{c}
CH_2I_2, Zn \\
\hline
\Delta
\end{array}$$
 Major product :

214. Find out nature of product obtained by selective bromination of following reactant:

(a) Meso

(b) Diastereomers

(c) Enantiomers

(d) Homomers

215. Devise a synthesis of following compound from cyclopentane:

- (a) $\xrightarrow{\text{Cl}_2} \xrightarrow{\text{alc. KOH}} \xrightarrow{\text{Br}_2} \xrightarrow{\text{CCl}_4}$
- (b) $\xrightarrow{\text{Br}_2} \xrightarrow{\text{C}_2\text{H}_5\text{O}^{\ominus}} \xrightarrow{\text{Br}_2, \text{CCl}_4} \xrightarrow{\text{Pr}_2, \text{CCl}_4}$
- (c) $\xrightarrow{\text{Br}_2} \xrightarrow{\text{alc. KOH}} \xrightarrow{\text{NBS}} \xrightarrow{\text{Br}_2} \xrightarrow{\text{CCl}_4}$
- (d) None of these
- 216. Which of the following alkene will give enantiomeric product on reaction with HBr?
- (b) ph (c) ph
- 217. Draw the product of following reaction with stereochemistry:

218. Devise synthesis of following compound from cyclohexene:

(a) Addition of HCN

(b) $\xrightarrow{\text{HBr}}$, $\xrightarrow{\text{NaCN}}$

(c) $\xrightarrow{\text{H}_2}$, $\xrightarrow{\text{NaCN}}$

(d) $\xrightarrow{\text{NBS}}$, $\xrightarrow{\text{HCN}}$, $\xrightarrow{\text{H}^{\oplus}/\text{H}_2\text{O}}$

Reactant 'A' is:

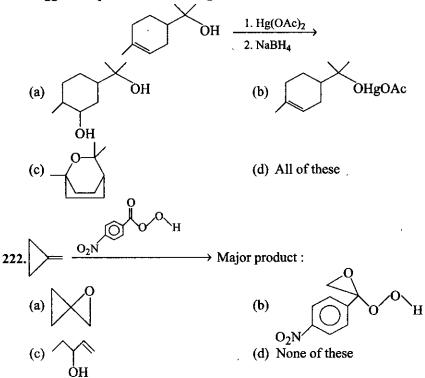
CF₃

(a) (b) (d) All of these

220.
$$CF_3$$
 1. HBr 2. H_2O (b) HN OH (c) $COOH$ (b) HN OH (c) CF_3 (d) None of these

221. Suggest the product of following reaction:

OH



223. HOOC
$$H$$
 $H_{2O_2, OH}$ $H_{2O_2, OH}$

224. Find out major product:

EXERCISE-2 MORE THAN ONE CORRECT ANSWERS



1. Which are correct regarding boiling point?

2. Which of the following orders are correct regarding stability?

Which of the following reagents can be used for above conversion?

- (a) Zn/Δ
- (b) Mg/Δ
- (c) NaI/acetone
- (d) Alc. KOH

- 4. The correct basicity orders are:
 - (a) $CH_3 \stackrel{\Theta}{-} CH_2 < H_2 C \stackrel{\Theta}{-} CH$
- (b) $CH_3 \stackrel{\Theta}{\longrightarrow} CH_2 > H_2C \stackrel{\Theta}{\longrightarrow} CH$
- (c) $CH_3 \longrightarrow CH_2 > HC \Longrightarrow C$
- (d) $H_2C = \overset{\Theta}{C}H > H C = \overset{\Theta}{C}$

5.
$$CH_3$$
 CH_3
 O_3
 Me_2s Products:

6. Choose the correct comparisons:

7. Which of the following reactions give meso product?

(a)
$$C = C$$
 $H \xrightarrow{Br_2, CCl_4}$
(b) $H \xrightarrow{C} C \xrightarrow{CH_3} \xrightarrow{Cold \ KMnO_4}$
(c) $C = C$
 $H \xrightarrow{Cold \ KMnO_4}$
 $C = C$
 $C \xrightarrow{H} \xrightarrow{Cold \ KMnO_4}$
 $C = C$
 $C \xrightarrow{H} \xrightarrow{Cold \ KMnO_4}$

8. Which of the following reactions give diastereomeric products?

- 9. Mark out the correct comparisons.
 - (a) $3^{\circ}H > 2^{\circ}H > 1^{\circ}H$ (reactivity for bromination)
 - (b) < >= CH₂ (stability)
 - (c) < CH₂ (reactivity toward HBr)
- (d) < > CH₂ (reactivity for catalytic hydrogenation)

10.
$$\hookrightarrow$$
 $\xrightarrow{\text{CH}_2}$ $\xrightarrow{\text{H}^{\oplus}, \text{H}_2\text{O}}$

Products are:

(a)
$$OH$$
 (b) OH (c) OH (d) OH

11. H_3C CH_2CH_3 M - $CPBA$ A H_3O B

Choose the correct statements regarding above reaction:

- (a) Product A is optically active
- (b) The conversion of alkene to product B is a stereospecific reaction
- (c) Product B has chiral molecule
- (d) Formation of 'A' is syn addition reaction
- 12. Which of the following reactions are not feasible?
 - (a) $HC = CH + KOH \longrightarrow$ (b) $HC = CH + NaNH_2 \longrightarrow$
 - (c) $HC = CH + NaOH \longrightarrow$ (d) $HC = CK^{\oplus} + (CH_3)_3C Br \longrightarrow$
- 13. The following synthesis cannot be carried out by:

$$CH = CH_{2}$$

(c)
$$\xrightarrow{\text{HOBr, H}^{\oplus}}$$
 $\xrightarrow{\text{Cl}_2/\text{Fe}}$ $\xrightarrow{\text{ICl}/\text{ZnCl}_2}$ $\xrightarrow{\text{Zn dust, CH}_3\text{COOH}}$

(d)
$$\xrightarrow{\text{Br}_2/\text{CH}_3\text{COOH}} \xrightarrow{\text{Cl}_2/\text{Fe}} \xrightarrow{\text{ICl/CH}_3\text{COOH}} \xrightarrow{\text{NaNH}_2} \xrightarrow{\text{NaNH}_2}$$

14. 1-butene is formed in reactions:

(a)
$$\xrightarrow{\Delta}$$
 (b) \xrightarrow{N} $\xrightarrow{CF_3CO_3H}$ $\xrightarrow{\Delta}$ (c) \xrightarrow{N} \xrightarrow{OH} $\xrightarrow{\Delta}$

15. Bu—C
$$\equiv$$
CH $\xrightarrow{\text{NaNH}_2}$ $A \xrightarrow{\text{Ph}$ —CHO $B \xrightarrow{\text{MnO}_2}$ C

Compound C of the reaction cannot be:

16. Acetone is the major product in:

I
$$H_2C = C = CH_2 \xrightarrow{H_3^{\oplus} O}$$

II $H_3C = C = CH \xrightarrow{Hg^{+2}/H_2SO_4}$

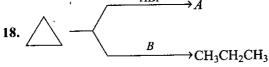
III $H_3C = C = CH \xrightarrow{BH_3 \cdot THF}$
 H_2O_2/OH

- (a) I
- (b) II
- (c) III
- (d) None of these
- 17. Which of the following can be prepared by Wurtz reaction?
 - (a) CH₃CH₃

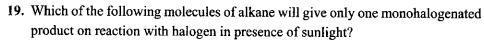
(b) CH₃CH₂CH₂CH₃

(c) H₃C—CH—CH₃

(d) CH₃—CH₂—CH— CH₃
CH₃



- (a) Compound A is B
- (b) Compound A is H_3C — CH_2 — CH_2 —Br
- (c) Reagent B is H₂/Ni at 120°C
- (d) Reagent B is LiAlH₄



(a) H₃C—CH₃

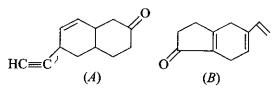
(b) H₃C—CH₂—CH₃

(c) $(H_3C)_{\perp}C$

- 20. Which of the following methods yield saturated hydrocarbon?
 - (a) R—CH=CH₂ $\xrightarrow{BH_3}$ $\xrightarrow{CH_2COOH}$
- (b) R—CH=CH₂ $\xrightarrow{\text{CH}_2\text{N}_2}$
- (c) $\xrightarrow{\text{Br}} \xrightarrow{\text{Na/ether}}$
- COOH $\xrightarrow{\text{NaOH} + \text{CaO}}$ (d)
- 21. Which of the following reactions will give result as alkane as major product?
 - (a) \sim Cl LiAlH₄

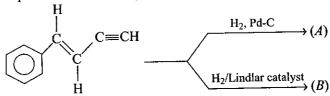
(c) \rightarrow Cl $\xrightarrow{\text{LiAlH}_4}$

- (d) \sim Cl NaBH₄
- 22. Which of the following alkanes cannot be synthesized by the Wurtz reaction in good yield?
 - (a) >>> (b) >>>
- (c) /
- 23. Which of the following reactions produce the same product?
 - (a) A Br₂, hv Na/ether
- (b) соон
- (c) \longrightarrow $\xrightarrow{Mg/ether}$ $\xrightarrow{CH_3Br}$
- COOH Red P + HI (d) >
- 24. How will you distinguish compounds A and B by using laboratory reagent?



- (a) A reacts with AgNO₃/NH₄OH
- (b) A reacts with Cu₂Cl₂/NH₄OH
- (c) B does not react with AgNO₃/NH₄OH
- (d) B reacts with Cu₂Cl₂/NH₄OH

25. Predict the products of following reactions:



- (a) A is Ph—CH₂—CH₂—CH₂—CH₃
- (b) B is Ph—CH=CH—CH=CH₂
- (c) A is Ph—CH=CH—CH=CH₂
- (d) B is Ph—CH₂—CH₂—CH=CH₂

26.
$$H_3C$$
— C = CH $\xrightarrow{1. \text{NaNH}_2}$ \xrightarrow{A} $\xrightarrow{H_2}$ $\xrightarrow{Pd\text{-BaSO}_4}$ B :

- (a) $A ext{ is } H_3C CH_2 C \equiv CH$ (b) $A ext{ is } CH_3 C \equiv C CH_2CH_3$
- (c) B is $C \rightarrow C$ CH_2CH_3 H_3C CH_2CH_3 H_3C CH_2CH_3 H CH_2CH_3

27. H_3C —C=CH $\xrightarrow{Hg^{+2}/H_2SO_4}$ X $\xrightarrow{KMnO_4}$ Y:

- (a) $X \text{ is } H_3C C = CH_2$ (b) $X \text{ is } H_3C C CH_3$

- (c) Y is H₃C—C—OH
- (d) Y is HCOOH
- 28. H_3C —C=CH $\xrightarrow{NaNH_2}$ X $\xrightarrow{Acetone}$ Y $\xrightarrow{Conc. H_2SO_4}$ Z:
 - (a) X is H_3C —CH=CH— CH_3 (b) X is H_3C —C= C^Θ Na $^\Theta$

(c) Y is H_3C — $C \equiv C$ —C— CH_3 (d) Z is H_3C — $C \equiv C$ — $C = CH_2$

 $C \Longrightarrow CH \xrightarrow{BuLi} X \xrightarrow{CH_3I} Y \xrightarrow{Hg^{+2}/H_3^{\oplus}O} Z:$

30. Which of the following solubility orders in water are correct?

(a)
$$H_3C - C = CH < H_3C - O - CH_3$$

(b)
$$H_3C--C \equiv CH > CH_3 --O --CH_3$$

(c)
$$H_2C = CH - CH_3 < H_3C - CH_2 - CH_3$$

(d)
$$H_2C = CH - CH_3 > CH_3CH_2CH_3$$

31.
$$CH_2 \xrightarrow{Br_2} A \xrightarrow{KCN} B$$
:

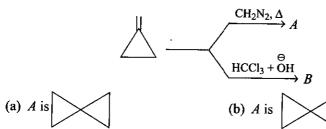
(a)
$$A$$
 is $CH_2-C \equiv N$ OCH_3

(c)
$$A$$
 is CH_2 —Br

(b)
$$B$$
 is CH_2 —Br OCH_3

(d)
$$B$$
 is $CH_2-C \equiv N$. OCH₃

32. Write the products of the following reaction:



(d)
$$B$$
 is

33.
$$H_3C$$
 $C=C$ H D_2/Ni

(a)
$$D \xrightarrow{CH_3} H$$
 (b) $H \xrightarrow{CH_3} D$ (c) $H \xrightarrow{CH_3} D$ (d) $H \xrightarrow{CH_3} D$ (e) $H \xrightarrow{CH_3} D$

(c)
$$D \longrightarrow H$$

$$(d) \stackrel{H}{\longleftarrow} D$$

$$CH_2$$

34.
$$\xrightarrow{m\text{-CPBA}} A \xrightarrow{H_3O^{\oplus}} B \text{ (Major)}$$

$$\xrightarrow{\text{I8} \text{NaOH}} C \text{ (Major)}$$

35. Which of the following carbocations would you expect to rearrange?

- 36. Select the correct statements:
 - (a) addition of Br₂ on trans-2-butene gives erythro product
 - (b) addition of Cl2 on cis-2-butene gives threo product
 - (c) addition of Br₂ on cis-2-butene gives racemic mixture
 - (d) addition of D₂ on cis-2-butene gives meso product
- 37. Which of the following will give allyl halide?

(a)
$$H_2C = CH - CH_3 \xrightarrow{SO_2Cl_2}$$
 (b) $H_2C = CH - CH_3 \xrightarrow{Cl_2, 800K}$
(c) $H_2C = CH - CH_3 \xrightarrow{NBS}$ (d) $H_3C - CH = CH_2 + HBr \xrightarrow{H_2O_2}$

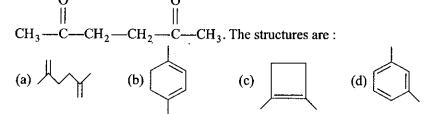
38. Which of the following reactions will give least substituted alkene?

$$(a) \xrightarrow{Conc. H_2SO_4} (b) \xrightarrow{Br} \xrightarrow{Me_3C \xrightarrow{\bigcirc}OK} (c) \xrightarrow{AgOH} (d) \xrightarrow{Br} \xrightarrow{Alc. KOH}$$

39. Which of the following reactions will give alkyne?

(a)
$$\stackrel{\text{NaNH}_2}{\longleftarrow}$$
 (b) $\stackrel{\text{KNH}_2}{\longrightarrow}$ Br $\stackrel{\text{KNH}_2}{\longrightarrow}$

40. An organic compound on reaction with O₃ followed by Zn and H₂O gives



41. Which of the following reactions are correctly represented?

(a)
$$R$$
—CH=CH₂ + HCl \longrightarrow R —CH—CH₃

Cl

(b)
$$R$$
— CH = CH_2 + $HI \xrightarrow{H_2O_2} R$ — CH_2 — CH_2 — I

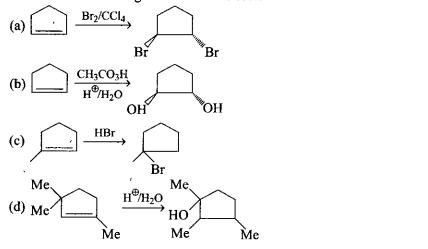
(c)
$$R$$
— CH = CH_2 + HBr $\xrightarrow{H_2O_2}$ R — CH_2 — CH_2 — Br

(d)
$$R$$
— CH = CH_2 + $HI \xrightarrow{H_2O_2} R$ — CH — CH_3

42. Which of the following give allylic substitution product?

(a)
$$\bigwedge \frac{\text{NBS/hv}}{\Delta}$$
 (b) $\bigwedge \frac{\text{SeO}_2}{\Delta}$ (c) $\bigwedge \frac{\text{OsO}_4}{\Delta}$ (d) $\bigwedge \frac{\text{SO}_2\text{Cl}_2}{\text{hv}}$

43. Which of the following reactions are correct?



- 44. Which of the following are correct for the addition of X_2 on alkene?
 - (a) Reaction involves cyclic halonium ion as intermediate
 - (b) Reaction involves carbocation intermediate
 - (c) Addition is anti addition reaction
 - (d) Trans alkene (Symmetrical) gives meso product
- 45. Which of the following will react with 1-butyne?
 - (a) $AgNO_3 + NH_4OH$

(b) $Cu_2Cl_2 + NH_4OH$

(c) Na

- (d) KMnO₄/OH
- 46. Which of the following do not give rearrangement of carbocation in the addition reaction of alkene?
 - (a) Br₂/CCl₄

(b) HBr

(c) HBr/H_2O_2 , hv

- (d) OsO_4
- 47. Which of the following will give acetone?

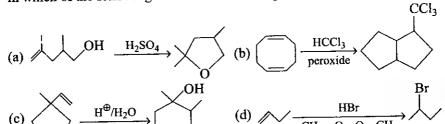
 - (a) H_3C —C=CH $\xrightarrow{Hg^{+2}, H_2SO_4}$ (b) CH_3 —C=CH $\xrightarrow{B_2H_6}$ $\xrightarrow{\Theta}$ OH H_2O
 - (c) $\xrightarrow{\text{KMnO}_4, \Delta}$

- (d) $HC \equiv CH + CH_3OH \longrightarrow$
- 48. Which of the following compounds can exhibit geometrical isomerism?
 - (a) H_3C — CH_2 —CH=CH— CH_3

(c)
$$H_3C$$
 OH $C=N$

- 49. Which of the following products will form by given reaction?

- 50. In which of the following reactions the correct product is given?



EXERCISE-3 LINKED COMPREHENSION TYPE



Passage-1

Conjugated diene reacts with unsaturated hydrocarbon in presence of heat to produce six membered cyclic product, this reaction is known as Diels-Alder reaction. For this reaction conjugated diene should be in cisiod form. Aromatic hydrocarbon do not give Diels-Alder reaction:

$$\begin{array}{c|c}
O & O & O \\
\hline
C-H & O & O \\
\hline
C-H & O & O \\
\hline
C-H & O & O \\
\hline
Diene Dienophile Intermediate$$

1. Which of the following conjugated unsaturated hydrocarbons will give Diels-Alder reaction?

2. Which of the following Diels-Alder reactions is fastest?

(a)
$$(b)$$
 (b) (b) (c) (c) (d) (d)

3. Find the product of following reaction:

Addition of X_2 on alkene is electrophilic addition reaction. Reaction proceed through the formation of 3-membered cyclic halonium ion. Nucleophile X^{\ominus} attacks from backside of cyclic halonium ion hence total reaction is anti addition reaction. If this reaction proceed in polar solvent then solvent itself acts as nucleophile.

$$C = C + X_2 \longrightarrow C - C$$

Mechanism:

$$C = C \longrightarrow X$$

$$X \longrightarrow X$$

- 4. Which of the following statements is incorrect?
 - (a) Symmetrical trans alkene gives 2 products on reaction with Br₂/CCl₄
 - (b) Symmetrical cis alkene gives 2 products on reaction with Br₂/CCl₄
 - (c) Trans alkenes give erythro product
 - (d) Cis alkenes give threo product

5.
$$\begin{array}{c|c}
Cl_2 (1 \text{ Mole}) \\
\hline
CCl_4
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl \\
CCl \\
CCl
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl \\
Cl \\
Cl
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl$$

$$\begin{array}{c|c}
CH_3 & Cl
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl$$

$$\begin{array}{c|c}
CH_3 & Cl
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl$$

$$\begin{array}{c|c}
CH_3 & Cl
\end{array}$$

$$\begin{array}{c|c}
CH_3 & Cl$$

(c)
$$\begin{array}{c} H \longrightarrow Ph \\ H_{3}CO \longrightarrow H \\ CH_{3} \end{array}$$
 (d) $\begin{array}{c} Ph \\ H \longrightarrow OCH_{3} \\ CH_{3} \end{array}$

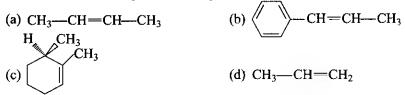
Addition of HX on alkene proceed through the formation of carbocation. This reaction is also known as Markownikoff reaction. According to Markownikoff's rule addition of electrophile occurs on that carbon of alkene which have more number of 'H' atom.

$$Ph-CH=CH_2 \xrightarrow{HX} Ph-CH-CH_3 + Ph-CH_2-CH_2-X$$
Major Minor

Mechanism:

$$\begin{array}{c} H \longrightarrow X \Longrightarrow H^{\oplus} + X^{\ominus} \\ Ph & \stackrel{\bigoplus}{\longleftarrow} Ph & \stackrel{\bigoplus}{\longleftarrow} C \longrightarrow CH_3 + Ph \longrightarrow CH_2 \longrightarrow CH_2 \\ H & More stable & Less stable \\ Ph & & & & & & & & \\ Ph & & & & & & & \\ Ph & & & & & & & \\ Ph & & & & & & & \\ Ph & & & & & & & \\ Ph & & & & & & & \\ Enantiomer & & & & & & \\ \end{array}$$

7. Which of the following alkenes can produce diastereomers?



8. Which of the following alkenes will give Markownikoff reaction?

(a)
$$F_3C$$
— CH = CH_2 \xrightarrow{HCl} (b) $H_3^{\oplus}N$ — CH = CH_2 \xrightarrow{HCl} (c) O_2N — CH — CH_2 \xrightarrow{HBr} (d) C = CH_2 \xrightarrow{HBr} CH_3

9. Arrange the following alkenes in decreasing order of reaction with HBr:

Alkene and alkyne both undergo electrophilic addition because of π electron density, they behave as electron rich species, alkenes are more reactive toward this reaction because the intermediate formed when an E^{\oplus} adds to an alkyne is a vinylic cation whereas the intermediate formed when an E^{\oplus} adds to alkene is alkyl cation, which is more stable.

12. In the reaction:

$$(a) \qquad (b) \qquad (d) \qquad (c) \qquad (d) \qquad (d)$$

$$CH_{2}=CH \xrightarrow{CH_{3}} Br$$

$$CH_{3}MgBr \xrightarrow{CH_{3}} B \xrightarrow{H_{2}, Pd-BaSO_{4}} E$$

$$2CH = CH \xrightarrow{CuCl} A \xrightarrow{O_{3}, THF} C \xrightarrow{H^{\oplus}, Hg^{+2}/H_{2}SO_{4}} D$$

13. Find structure of compound A:

(a)
$$CH_2 = CH - CH - CH_3$$
 (b) $H_2C = CH - CH = CH_2$ (c) $HC = C - C = CH$ (d) $H_2C = CH - C = CH$

14. Find structure of compound E:

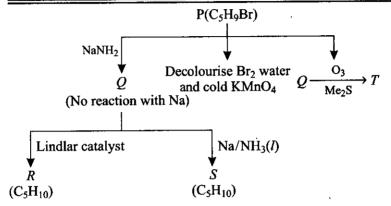
(a)
$$H_2C = CH - C = C - CH_2 - CH = C$$
 CH_3

(b) $H_3C - CH_2 - C = C - CH_2 - CH = C$
 CH_3
 CH_3

15. Find structure of compound D:

(a)
$$H \longrightarrow H$$
 (b) $H \longrightarrow G$ (c) $H \bigcirc G$ (d) $H \bigcirc G$ OH

Passage-6



16. Which of the following is compound P?

(a)
$$(b)$$
 (c) (d) (d) (d)

- 17. R and S are:
 - (a) position isomers
 - (c) geometrical isomers
- (b) enantiomers
- (d) functional group isomers
- 18. Identify structure of compound T:

(a)
$$CH_3$$
— C — OH (b) O

(c) CH_3 — CH_2 — C — OH (d) CH_3 — C — H

Passage-7

Hydroboration oxidation reaction is a process of addition of H₂O according to Anti-Markownikoff's rule.

$$CH_3CH = CH_2 \xrightarrow{BH_3.THF} CH_3 - CH_2 - CH_2 - OH$$

$$H_2O_2, OH$$

Reaction is regioselective. Regioselectivity of reaction is increased by using hindered boranes.

THF (Tetrahydrofuran) is used to control reactivity of borane.

$$CH_{3}-CH=CH_{2} \\ H-BH_{2} \\ H-BH_{2} \\ H-BH_{2} \\ CH_{3}-CH=CH_{2} \\ H-BH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}CH_{2}BH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}CH_{2}BH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}CH_{2}BH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}CH_{2}BH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH=CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH_{2} \\ CH_{3}-CH_{2}-CH_{2}-CH_{2} \\ CH_{3}-CH_{$$



Alkane may be prepared from alkyl halide by Wurtz method where alkyl halide reacted with Na in presence of ether.

$$2R - X \xrightarrow{\text{Ether}} R - R + 2\text{Na}X.$$

Mechanism:

$$2\text{Na} \longrightarrow 2\text{Na}^{\oplus} + 2e^{-}$$

$$2e^{-} + R \longrightarrow X \longrightarrow R^{\ominus} + X^{\ominus}$$

$$R^{\ominus} + R \longrightarrow X \longrightarrow R \longrightarrow R + X^{\ominus}$$

$$2\text{Na}^{\oplus} + 2X^{\ominus} \longrightarrow 2\text{Na}X$$

22.
$$CH_3CH_2$$
— $Cl \xrightarrow{Na/ether}$

Which of the following products may not be formed?

(a)
$$CH_3$$
— CH_3

(c)
$$CH_2 = CH_2$$

23.
$$CH_3 \xrightarrow{C} Br \xrightarrow{Na/ether} Major product :$$

$$CH_3$$

(a)
$$H_2C = C$$
 CH_3
 CH_3

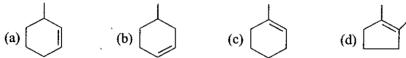
24. Which of the following compounds is most reactive for Wurtz reaction?

Br
(a)
$$CH_3$$
— CH_2 — CH_3
(b)
$$CH_3$$
(c)
$$CH_3$$
(d) CH_3 — C — Br

$$CH_3$$

Hydrocarbon $A(C_7H_{12})$ was treated with BH_3 . THF; H_2O_2 , NaOH to produce $B(C_7H_{14}O)$ as only product. Reaction of B with TsCl/pyridine followed by KOH gives C (isomeric with A) in addition to the olefinic products. Treatment of C with ozone followed by Zn/AcOH produces only compound shown below:

25. What is correct structure of 'A'?



26. What is correct structure of 'B'?

27. What is correct structure of compound 'C'?

Passage-10

Oxymercuration demercuration reaction is process of addition $\rm H_2O$ according to Markownikoff's rule without any rearrangement.

$$CH_{3}-CH-CH_{2} \xrightarrow{Hg(OAc)_{2}, H_{2}O} CH_{3}-CH-CH_{3}$$

$$CH_{3}-CH-CH_{2} \xrightarrow{NaBH_{4}, OH} CH_{3}-CH-CH_{3}$$

Mechanism:

$$Hg(OAc)_{2} \rightleftharpoons Hg(OAc) + AcO$$

$$CH_{3}CH = CH_{2} \rightarrow CH_{3} CH - CH_{2} \xrightarrow{-H^{\oplus}} CH_{3} - CH - CH_{2} \rightarrow CH_{3} - CH - CH_{3}$$

$$Hg^{\oplus} \qquad OH \qquad H \qquad H$$

$$OAc \qquad H \qquad H$$

Base OH is used to neutralise H[®] produced during the reaction:

(d) Both (a) and (b)

Free radical substitution chalcogenation is shown by the compounds having at least one H-atom an sp3-hybridised carbon atom. Here substitution is due to free radical formation in presence of sunlight or heat or peroxide. The abstruction of H-atom is on the basis of stability of free radical formed.

$$\begin{array}{c} \text{H}_{3}\text{C} \\ \text{H}_{3}\text{C} \\ \downarrow \\ S \end{array} \xrightarrow{R} \begin{array}{c} \text{CH}_{2} - \text{CH}_{3} \xrightarrow{X_{2}} \\ \downarrow \\ Q \end{array} \xrightarrow{\text{hv}} .$$

- 31. Which of the above hydrogen can be abstracted easily by halogen in presence of sunlight?
 - (a) *P*
- (b) Q
- (c) R
- (d) S
- 32. In the above reaction how many monobrominated products are possible? (d) 7
 - (a) 3

(a) *P*

1. Column (I)

(b) 4

(b) Q

(c) 5

(c) R

33. Which of these H-atom can be substituted to get an optically active halide? (d) S

MATRIX MATCH TYPE

Column (II)

$$(b) \bigcup_{OH} OH$$

P. Red P + HI

Q. Na/ether

$$(\mathsf{d}) \bigcirc \overset{\bullet}{\longleftrightarrow} \mathsf{COOH} \longrightarrow \bigcirc \overset{\oplus}{\longleftrightarrow} \mathsf{COO}$$

S. Zn-Hg/HCl

2. Column (I)

Column (II)

(a)
$$2CH_3$$
— CH — X \longrightarrow CH_3 — CH — CH — CH_3 P . LiAlH₄
 CH_3 CH_3

$$(b) \mid CH_2 - X \longrightarrow CH_2 \atop CH_2 - X \longrightarrow CH_2$$

Q. Na, dry ether

(c)
$$CH_3$$
— CH — X — CH_3 — CH_2
 CH_3 CH_3

(d)
$$CH_3$$
 CH_3 CH_3 CH_3 CH_3 CH_3

R. Mg, dry ether

S.
$$Zn/\Delta$$

3. Column (I)

(a)
$$Cl_2$$
, CCl_4

$$(b) \bigwedge \xrightarrow{\operatorname{Cl}_2, \, \mathsf{hv}} \operatorname{Cl}_{\bigvee}$$

(c)
$$\xrightarrow{\text{Br}} \xrightarrow{\text{CH}_3\text{OH}} \xrightarrow{\text{CH}_3\text{OH}}$$

(d)
$$\xrightarrow{H^{\oplus}/H_2O}$$
 \xrightarrow{OH}

4. Column (I)

$$(a) \left\langle \bigcirc \right\rangle - C = C - \left\langle \bigcirc \right\rangle$$

(c)
$$\langle \bigcirc \rangle$$
—C \equiv C—CH₂CH₃

Column (II)

- P. Rearrangement
- Q. Carbocation
- R. Free radical
- S. Cyclic transition state
 Column (II)
- P. Reacts with H2-Pd/CaCO3
- Q. Trans alkene will form when reacted with Na/Liq. NH₃
- R. Reacts with ammoniacal AgNO₃
- S. On oxidative ozonolysis produces CO₂

Column (II)

5. Column (I)

(a)
$$H_3C$$
— $C \equiv C$ — CH_3 — H_3C — C — C
 H

(b)
$$H_3C$$
— C = C — CH_3 \longrightarrow H_3C
 C = C
 CH_3

P. H₂, Pd-BaSO₄

Q. Li, Liq. NH₃

(c)
$$H_3C-CH=CH-CH_3 \longrightarrow R$$
. $HN=NH$, Δ
 $H_3C-CH_2-CH_2-CH_3$
 $CH_3 \longrightarrow CH_3$

(d) $\longrightarrow S$. B_2H_6 , CH_3COOH

6. Column (I)

(a) $C=CH_2 \xrightarrow{HBr} P$. Free radical

 $CH_3CH_2 \longrightarrow P$. Free radical

(b) $H \xrightarrow{C} D \longrightarrow Q$. Enantiomer

(c) $O \longrightarrow D \longrightarrow D \longrightarrow D$
 $O \longrightarrow D \longrightarrow D \longrightarrow D$

7. Column (I)

(a) $O \longrightarrow D \longrightarrow D$

(b) $O \longrightarrow D \longrightarrow D$

(c) $O \longrightarrow D \longrightarrow D$

(d) $O \longrightarrow D \longrightarrow D$
 $O \longrightarrow D \longrightarrow D$

(e) $O \longrightarrow D \longrightarrow D$

(f) $O \longrightarrow D \longrightarrow D$

(g) $O \longrightarrow D \longrightarrow D$

(h) $O \longrightarrow D \longrightarrow D$

(h) $O \longrightarrow D \longrightarrow D$

(h) $O \longrightarrow D \longrightarrow D$

(c) $O \longrightarrow D \longrightarrow D$

(d) $O \longrightarrow D \longrightarrow D$

(e) $O \longrightarrow D \longrightarrow D$

(f) $O \longrightarrow D \longrightarrow D$

(g) $O \longrightarrow D \longrightarrow D$

(h) $O \longrightarrow D \longrightarrow D$

(h

- (b) Anti-Markownikoff product
- $Q. \xrightarrow{\text{H}_3\text{C}} \text{C} = \text{C} \xrightarrow{\text{CH}_3} \xrightarrow{\text{CHCl}_3 + \text{KOH}}$

(c) Peroxide effect

- $R. \left\langle \bigcirc \right\rangle CH = CH_2 \xrightarrow{HCI}$
- (d) Mixture of stereoisomers
- S. CF_3 —CH= $CH_2 \xrightarrow{HBr}$

9. Column (I)

(a)
$$Conc. H_2SO_4 \rightarrow \Delta$$

P. Hofmann's alkene

- C1 C_2H_5O/C_2H_5OH
- Q. Saytzeff's alkene

 $(c) \xrightarrow{\bigcap} \underbrace{\operatorname{Me_3COK}^{\oplus}}_{Cl}$

R. Transition state

(d) Alc. KOH

S. Carbocation

10. Column (I)

(a)
$$CH_3$$
 CH_3 O_3 Me_2S

Column (II)

- (a) $\overline{\text{Me}_2\text{S}}$ (b) $\overline{\text{CH-CH}_2}$ $\overline{\text{CH-CH}_2}$ $\overline{\text{CH-CH}_2}$ $\overline{\text{O}_3}$ $\overline{\text{Q}}$.
- P. 3 different products

(c) H_3C —C=CH $\xrightarrow{O_3}$ $\xrightarrow{Ag_2O}$

- Q. CO₂ will produce
- (d) H_3C —CH=C= $CH_2 \xrightarrow{O_3} Zn-H_2O$
- R. Oxidative ozonolysis

S. Reductive ozonolysis

- 11. Column (I)
 - (a) $C = C \xrightarrow{H_3 C} CH_3 \xrightarrow{Cold \ KMnO_4} COLD CH_4 \xrightarrow{Cold \ KMnO_4} COLD$

P. Racemic mixture

Column (II)

- (b) H C = C H Br_2, CCl_4 Br_2, CCl_4
- Q. Erythro

(c)
$$H_3C$$
 $C=C$ H CF_3CO_3H H^{\oplus}/H_2O

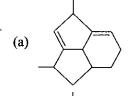
R. Threo

(d)
$$H_3C$$
 $C=C$ H Cl_2, CCl_4 Cl_3

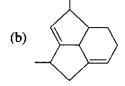
S. Meso product

12. Column (I)

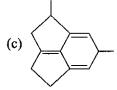
Column (II)



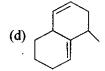
P. Dicarboxylic acid will be formed when reacts with not alkaline KMnO₄.



Q. Decolourise Br₂/H₂O.

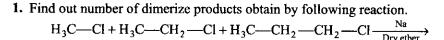


R. Dicarboxylic acid and will be formed when reacts with O_3/H_2O_2 .



S. Number of allylic hydrogen is odd.

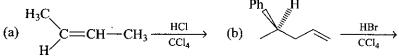
EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS



2. How many mono chlorinated products may be obtained when the alkane shown below is heated in the presence of Cl₂



3. How many of the following reactions, leads to the formation of diastereomers.





(c)
$$Ph$$
 $C = CH_2 \xrightarrow{HBr}$ (d) $CH_3 \xrightarrow{HCl}$ $CCI_4 \xrightarrow{CCI_4}$ (e) $CH_3 \xrightarrow{HCl}$ $CH_3 \xrightarrow{HCl}$ $CH_4 \xrightarrow{CCI_4}$ (f) $CH_3 \xrightarrow{HCl}$ $CCI_4 \xrightarrow{CCI_4}$

4. Identify number of chiral centers present in product obtained by following reaction.

$$\begin{array}{c|c} & & Br_2 \\ \hline \\ CH_3 & H \end{array}$$

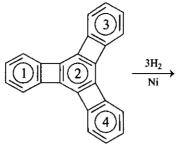
5. How many of the following addition reactions are syn addition reaction.

(a)
$$H_3C$$
 CH_3 Br_2 CCI_4 (b) H_3C CH_3 H_2, Ni CCI_4 (c) H_3C CI_4 CI_5 CI_5

6. Of the following reactions how many reactions are considered as oxidation reaction.

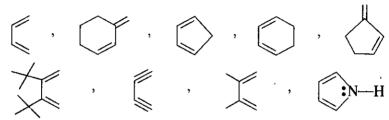
(a)
$$Ph \xrightarrow{Ag_2O}$$
 (b) $KMnO_4/OH \rightarrow Ag_2O$
(c) $Cl \xrightarrow{L1AlH_4}$ (d) $MaBH_4 \rightarrow Ag_2O$
(e) $CH_3CO_3H \rightarrow Ag_2O$
(f) $NaBH_4 \rightarrow Ag_2O$

7.



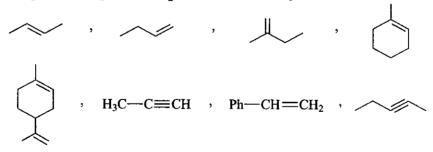
In this reaction which ring will be reduced, by hydrogenation.

8. Of the following compound, find out numbers of conjugated unsaturated hydrocarbon those would not show Diels alder reactions.



9. How many different products (excluding stereoisomer) can be obtained by following reaction.

10. Examine the structural formulas of following compounds and find how many compounds will produce CO₂ on oxidative ozonolysis.





ANSWERS



Exercise-1 : Only One Correct Answer

Le	vei-	1_																	
1.	(a)	2.	(b)	3.	(a)	4.	(b)	5.	(b)	6.	(b)	7.	(b)	8.	(b)	9.	(c)	10.	(c)
11.		12.		13.		14.		15.		16.		17.			(d)				(b)
21.		22.		23.		24.		25.		26.		27.		28.		29.		30.	
<u>,</u> 31.	(a)	32.	(d)	33.	(c)	34.	(a)	35.	(b)	36.	(a)	37.	(c)		(b)	39.	(a)		(d)
41:	(d)	42.	(c)	43.	(d)	44.	(a)	45.	(a)	46.	(c)	47.	(b)	48.	(d)	49.	(b)	5 0.	(c)
١.		_		-															
Le	vel-	² ==											-		===				
1.	(c)	2,	(b)	3.	(c)	4.	(c)	5.	(a)	6.	(c)	7.	(d)	B.	(d)	9.	(b)	10.	(a)
11.	(a)	12.	(b)	13.	(c)	14.	(c)	15.	(d)	16.	(d)	17.	(b)	18.	(b)	19.	(d)	ź0.	(d)
21.	(c)	22.	(a)	23.	(c)	24.	(b)	25.	(a)	26.	(d)	27.	(c)	28.	(c)	29.	(b)	30.	(d)
31.	(c)	32.	(a)	33.	(a)	34.	(d)	35.	(d)	36.	(a)	37.	(b)	38.	(b)	39.	(b)	40.	(d)
41.	(a)	42.	(b)	43.	(c)	44.	(c)	45.	(c)	46.	(a)	47.	(d)	48.	(a)	49.	(b)	50.	(b)
51.	(c)	52.	(d)	53.	(c)	54.	(a)	55.	(c)	56.	(b)	57.	(b)	58.	(p)	59.	(c)	60.	(c)
61.		62.	(c)	63.	(a)	64.	(c)	65.	(b)	66.	(b)	67.	(c)	68.	(a)	69 .			(c)
71.		72.		73.		74.		75.		76.			(b)	78.		79.			
81.	٠.	82.		83.	• •	84.	, ,			86.								. 90.	!
91.		92.						•					(c)					100.	- 1
ŀ	` '				٠,			105.											- 1
								115. 125.											- 1
								135.											- 1
Ę.								145.											
t .								155.			_								
								165.											
								175.											
181.	(c)	182.	(d)	183.	(a)	184.	(b)	185.	(b)	186.	(d)	187.	(b)	188.	(d)	189.	(d)	190.	(p)
191.	(c)	192.	(c)	193.	(c)	194.	(b)	195,	(d)	196.	(b)	197.	(a)	198.	(c)	199.	(b)	200.	(c)
201.	(d)	202.	(a)	203.	(c)	204.	(d)	205.	(b)	206.	(b)	207.	(a)	208.	(c)	209.	(c)	210.	(a)
	,							215.		216.	(b)	217.	(a)	218.	(b)	219.	(d)	220.	(b)
221,	(c)	222.	(<u>a</u>)	223.	(c)	224.	(a)	<u>225.</u>	(ċ)			•							
_					_	_													

Exercise-2: More Than One Correct Answers

ı	1. ((a, b, c, d)	2.	(a, c)	3.	(a, b, c)	4.	(b, c, d)	5.	(a, b, c)	6.	(a, b, d)
Į	7.	(a, b)	8.	(b, c)	9.	(a, b, c)	10.	(a, b, c)	11.	(b, c, d)	12.	(a, c, d)
I	13.	(a, b, d)	14.	(á, b, c, ď)	15.	(a, b, c)	16.	(a, b)	17.	(a, b)	18.	(b, c)
Ì	19.	(a, c, d)	20.	(a, b, c, d)	21.	(a, b, d)	22.	(a, c, d)	23.	(a, b. c, d)	24.	(a, b, c)
										(a, b, c)		

					-						~~~~ ~~~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
31.	(c, d)	32.	(a, c)	33.	(b, c)	34,	(a, b, d)	35.	(a, b, d)	36.	(a, b, c, d)
37.	(a, b, c)	38.	(b, c)	39.	(a, b, c)	40	(a, b, c)	41.	(a, c, d)	42.	(a, b, d)
43.	(a,,b, c)	44.	(a, c, d)	45.	(a, b, c, d)	46.	(a, c, d)	47	(a, c)	48.	(a, b, c, d) (a, b, d) (a, b, c)
	(a, b, d)					_					

Exercise-3: Linked Comprehension Type

1. (d) 11. (b)	2. (a)	3 (b)	4. (a)	5. (b)	6 (d)	7. (c)	8 (d)	9. (b)	10. (a)
11. (b)	12. (c)	13. (d)	14 (c)	15. (a)	16 (a)	17. (c)	18. (b)	19. (b)	20. (c)
21. (d)	22 . (d)	23. (a)	24 (b)	25. (c)	26 (d)	27 (a)	28. (b)	29 (c)	30 (b)
31. (d)	<u>32. (c)</u>	33. (b)		_					

Exercise-4: Matrix Match Type

1. (a) → Q;	(b) $\rightarrow R$;	(c) $\rightarrow P.R.S$;	$(d) \rightarrow Q, R$	'
2. (a) → Q;	(b) $\rightarrow Q.R.S$;	(c) $\rightarrow P$;	$(d) \rightarrow P, Q$,
3, (a) → S;	(b) $\rightarrow R$;	(c) $\rightarrow P,Q$;	$(d) \rightarrow P, Q$	t
4. (a) $\rightarrow P,Q$;	(b) $\rightarrow P, R, S$;	(c) $\rightarrow P, Q$;	$(d) \rightarrow P, R, S$	
5. (a) → P,R,S;	(b) $\rightarrow Q$;	(c) $\rightarrow R, S$;	$(d) \rightarrow Q$	1
6 . (a) → Q,S;	$(b) \rightarrow R, S;$	(c) $\rightarrow P, Q$;	$(d) \rightarrow P, Q$	i
' フ . (a) → Q,R;	(b) $\rightarrow Q, R$;	(c) $\rightarrow P$;	$(d) \rightarrow P, S$	
R . (a) $\rightarrow R$;	(b) $\rightarrow P$, S;	(c) $\rightarrow P$;	$(d) \rightarrow Q, R$	1
5. (a) → Q,S;	(b) $\rightarrow Q,R$;	(c) $\rightarrow P, R$;	$(d) \rightarrow P, R$	
10. (a) $\rightarrow P, S$;	(b) $\rightarrow P, Q, R$;	(c) $\rightarrow Q,R$;	$(d) \rightarrow P, Q, S$	ļ
11. (a) $\rightarrow Q, S$;	(b) $\rightarrow P, R$;	(c) $\rightarrow Q, S$;	(d) $\rightarrow Q$, S	1
12. (a) $\rightarrow P, Q, R$;	(b) $\rightarrow P, Q, R, S;$	(c) $\rightarrow P_{\perp}Q, R, S;$	(d) → Q	_

Exercise-5: Integer Answer Type Problems

									٦.
<u>1. (5) 2. (1)</u>	<u>3. (4)</u>	<u>4.</u> (3)	<u>5. (4)</u>	<u>6</u> (3)	<u>7. (2)</u>	<u>3 (5)</u>	<u>9. (4)</u>	10 ((5).



Halides

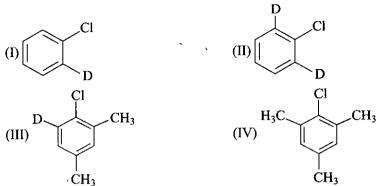
ONLY ONE CORRECT ANSWER



	LEVEL-1
 Which of the following statemen (a) All negatively charged specie (b) Nucleophiles are Lewis bases (c) Alkenes, alkynes, benzene an (d) All are correct 	s are nucleophiles
2. Consider the species.	
(I) $\overset{\circ}{\text{O}}\text{H}$ (II) $\overset{\circ}{\text{CH}}_3$ — $\overset{\circ}{\text{C}}$	(III) CH ₃ (IV) NH ₂
Arrange these nucleophilic speci- (a) III > IV > II > I (c) I > II > III > IV	es in their decreasing order of nucleophilicity: (b) II > I > III > IV (d) III > I > II > IV
3. The nucleophilicities of CH ₃ , NI	1-,OH and F decrease in which order?
(a) $CH_3^- > NH_2^- > OH^- > F^-$	(b) $OH^- > NH_2^- > CH_3^- > F^-$
(c) $NH_2^- > OH^- > CH_3^- > F^-$	(d) $CH_3^- > OH^- > F^- > NH_2^-$
(a) $OH^- > CH_3COO^- > OCH_3^- >$	
(b) CH ₃ COO ⁻ < C ₆ H ₅ O ⁻ < OCH	
(c) $C_6H_5O^- < CH_3COO^- < CH_3$	
$(d) CH_3COO^- < C_6H_5O^- < OH^-$	CH ₃ O
5. Correct order of leaving group to	
$(a) I^- > Br^- > Cl^- > F^-$	(b) F" > Cl" > Br" > l"
$(c) Cl^- > F^- > Br^- > l^-$	(d) $\Gamma > C\Gamma > Br^- > F^-$
6. 2-Chlorobutane 15% aq. solution of	$\xrightarrow{\text{ethyl alcohol}} P \qquad \qquad \xrightarrow{z \to -1} \xrightarrow{z \to -1} \qquad \qquad z \to $
	n takes place. % of inverted product would be:
(a) 30 (b) 70	(c) 35 (d) 65
7. In reaction $C_2H_5OH + HX - \frac{7A}{2}$	$C_2H_5X + H_2O$ the order of reactivity of
HX is:	
(a) HBr > HI > HCl (c) HCl > HBr > HI	(b) HI > HCl > HBr (d) HI > HBr > HCl
9.1.18.3 / BDI / BI	TOTAL TIDE AND THE

8.	Which of the following leads to the form	nation of an alkyl halide?
	(a) $C_2H_5OH \xrightarrow{\text{Red } P+Br_2}$	(b) $C_2H_5OH \xrightarrow{SOCI_2}$
	(c) $C_2H_5OH \xrightarrow{KBr+Conc H_2SO_4}$	(d) All of these
9.	Which reaction is termed as Darzen's re	eaction?
	(a) $ROH + HCl$ (b) $ROH + PCl_5$	(c) $ROH + SOCl_2$ (d) $ROH + PCl_3$
10.	The S_{N}^{2} reactivity order for halides is :	
	(a) $R \longrightarrow F > R \longrightarrow Cl > R \longrightarrow Br > R \longrightarrow R$	I
	(b) $R - I > R - Br > R - Cl > R - Br$	7
	(c) $R - Br > R - 1 > R - Cl > R - F$	7
	(d) $R - Cl > R - Br > R - F > R - Cl$	I
11.	In S_N 1 reaction, the first step involves t	he formation of:
	(a) free radical	(b) carbanion
	(c) carbocation	(d) final product
12.	The rate law for the reaction, RCl + Na	$(aq.) \longrightarrow ROH + NaCl$ is given by, fate
	= $K_1[RC1]$. The rate of the reaction will	be:
	(a) doubled on doubling the concentrati	on of sodium hydroxide
	(b) halved on reducing the concentratio	n of alkyl halide to half
	(c) decreased on increasing the tempera	ture of the reaction
	(d) unaffected by increasing the temper	ature of the reaction
13.	Acetaldehyde reacts with PCl ₅ , to give	:
	(a) ethyl chloride	(b) ethylene chloride
	(c) ethylidene dichloride	(d) trichloroacetaldehyde
14.	Vinylic halides are unreactive towards	nucleophilic substitution because of the
	following except:	
	(a) C-halogen bond is strong	
	(b) The halogen is bonded to sp^2 carbo	
	(c) A double bond character is deve resonance	eloped in the carbon-halogen bond by
	(d) Halide ions are not good leaving gr	roups
15.	An alkyl halide may be converted into	
	(a) addition	(b) substitution
	(c) dehydrohalogenation	(d) climination
16.		$_5$ Br + KCN(aq.) \longrightarrow C ₂ H ₅ CN + KBr:
	(a) elimination	(b) nucleophilic substitution
-	(c) electrophilic substitution	(d) redox change

17. Which of the following will not undergo nucleophilic aromatic substitution?



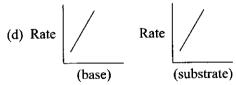
- (a) I, II and III
- (b) II and IV
- (c) III and IV
- (d) only IV
- 18. Arrange the following alkyl chlorides in order of decreasing reactivity in an S_N 1 reaction:
 - (I) isopropyl bromide
 - (III) tert-butyl bromide
 - (a) (III) > (I) > (II) > (IV)
 - (c) (IV) > (III) > (II) > (I)
- (II) propyl bromide
- (IV) methyl bromide
- (b) (I) > (III) > (IV) > (II)
- (d) (I) > (II) > (IV)
- 19. Which one of the following is most reactive towards nucleophilic substitution reaction?
 - (a) $CH_2 = CH Cl$

(b) C_6H_5Cl

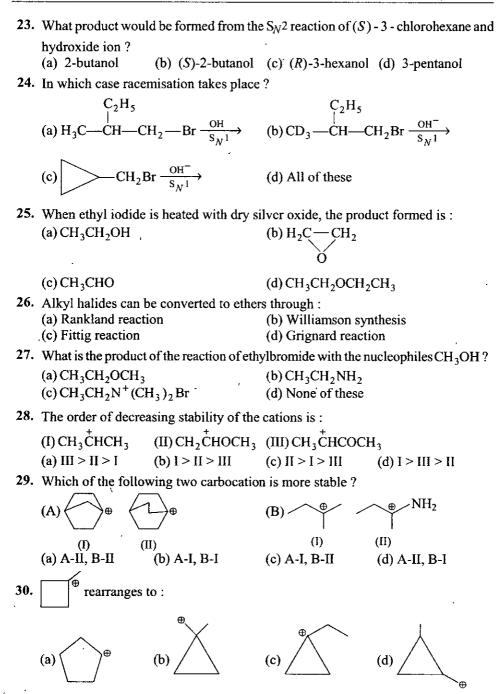
(c) $CH_3CH = CH - Cl$

- (d) $ClCH_2$ —CH= CH_2
- 20. What product would be formed from the S_N^2 reaction of (R)-2-bromobutane and hydroxide ion?
 - (a) 2-butanol
- (b) (S)-2-butanol (c) (R)-3-hexanol (d) 3-pentanol

- 21. Which is not correct about S_N^2 ?
 - (a) Rate of $S_N 2$ is directly proportional to the dielectric constant of medium.
 - (b) Rate of S_N 2 is directly proportional to the nature of leaving group.
 - (c) Rate of S_N^2 inversely proportional to the steric hindrance present in substrate.



- 22. The reaction of 4-bromobenzyl chloride with NaCN in ethanol leads to:
 - (a) 4-Bromobenzyl cyanide
 - (b) 4-Cyanobenzyl chloride
 - (c) 4-Cyanobenzyl cyanide
 - (d) 4-Bromo-2-cyanobenzyl chloride



(a) H_2O

31. Which of the following reactions will go faster if the concentration of the nucleophile is increased?

(a)
$$CH_{3}$$

$$+ CH_{3}O^{-} \longrightarrow CH_{3}$$

$$Br + CH_{3}S^{-} \longrightarrow CCCH_{3}$$

$$CH_{3}$$

$$CH_{3}$$

$$CH_{3}$$

$$CH_{3}$$

$$CH_{3}$$

$$CH_{3}$$

$$CCCH_{3}$$

$$CCCH_{3}$$

- (d) No comparison between these reactions
- 32. Suggest the suitable solvent for the reaction given below.

$$(b) C_2H_5OH \qquad (c) HCONMe_2 \qquad (d) C_6H_6$$

33. What is the principal product of the following reaction?

$$\begin{array}{c} CH_{3} \\ H \longrightarrow Br \\ H \longrightarrow H + NaN_{3} \longrightarrow Product \\ H \longrightarrow Cl \\ CH_{3} \\ (a) H \longrightarrow H \\ H \longrightarrow Cl \\ CH_{3} \\ (b) H \longrightarrow H \\ Cl \\ CH_{3} \\ (c) H \longrightarrow H \\ H \longrightarrow Cl \\ CH_{3} \\ (d) H \longrightarrow H \\ Cl \\ (d) H \longrightarrow H \\$$

- 34. Which of the following reaction is possible?
 - (a) $C_6H_5OH + HBr \longrightarrow C_6H_5Br + H_2O$
 - (b) $(CH_3)_3CCI + NaOCH_3 \longrightarrow (CH_3)_3COCH_3 + NaCI$

(c)
$$Cl$$
 OMe
$$Cl + CH_3ONa \xrightarrow{CH_3OH} Cl$$
(d) $Cl + C_6H_5MgBr \xrightarrow{H_3O^+} C_6H_5CH_2C(CH_3)_2$
OH

Correct order of rate of S_N^2 for A, C and D will be:

- (a) A > C > D
- (b) C > D > A
- (c) A > D > C (d) C > A > D
- 36. The order of reactivity of alkyl halide in the reaction $R \longrightarrow X + Mg \longrightarrow RMgX$
 - (a) RI > RBr > RCI

(b) RCl > RBr > RI

(c) RBr > RCl > RI

- (d) RBr > RI > RC1
- 37. The reaction of $H_2C CH_2$ with RMgX, leads to the formation of:
 - (a) RCHOHR
- (b) RCHOHCH₃ (c) R₂CHCH₂OH (d) RCH₂CH₂OH
- 38. Which of the following compounds on reaction with CH₃MgBr will give a tertiary alcohol?
 - (a) C₆H₅CHO

(c) C₂H₅COOH

- (d) CH₃CH—CHCH₃
- 39. RMgBr + $A \xrightarrow{\text{H}_3\text{O}^{\oplus}} \text{CH}_3\text{CH}_2\text{CH}_2\text{OH}, R$ and A are :
 - (a) CH₃CH₂ and HCHO

(c) both are correct

- (d) none is correct
- 40. $CH_3MgBr + CH_2 = CH C H \xrightarrow{H_3O^+} Product (1, 4 addition). It is:$

$$\begin{array}{c} \text{OH} \\ (a) \text{ CH}_2 = \text{CH} - \begin{array}{c} \text{CH} \\ \text{CH}_3 \end{array} \\ \text{CH}_3 \end{array} \qquad \begin{array}{c} \text{(b) CH}_2 \text{ CH} = \text{CH} - \text{CH}_3 \\ \text{OH} \end{array}$$

(c) CH₃CH₂CH₂CHO

- (d) none is correct
- 41. The product obtained on treating acetone with ethyl magnesium bromide followed by hydrolysis is:

OH
(b)
$$H_3C - \overset{!}{C} - \overset{!}{C} - \overset{!}{C} - CH_3$$
 $\overset{!}{H} \quad \overset{!}{H_2}$

$$(d)$$
 H_3C \longrightarrow OH CH_3

42. Consider the following reaction,

Consider the following reaction,
$$CH_3CH_2OH + CH_3CH_2MgBr \longrightarrow CH_3CH_2H^* + Mg \qquad \text{which of}$$

$$Br$$
which of

the following statements is (are) correct?

- (a) CH₃CH₂OH + CH₃CH₂H* comes from the Grignard reagent.
- (b) H* in CH₃CH₂H* comes from the Grignard reagent.
- (c) H* in CH₃CH₂H* comes from ethanol.
- (d) H* in CH₃CH₂H* comes from the alkyl group of alcohol.
- 43. 2-Phenylethanol may be prepared by the reaction of phenyl magnesium bromide with:
 - (a) HCHO
- (b) CH₃CHO (c) CH₃COCH₃ (d)

44. Order of rate of reaction of following compound with phenyl magnesium bromide is:

$$Me - C - Cl$$
, $Me - C - H$, $Me - C - O - Et$

- (a) I > II > III
- I < III < III (d)
- (c) III > I > II (d) II > I > III
- 45. Select the correct order of decreasing reactivity of the following compounds towards the attack of Grignard reagent.
 - (I) Methyl benzoate

(II) Benzaldehyde

(III) Benzoylchloride (a) II > III > I > IV

(IV) Acetophenone (b) 1 > 11 > 111 > 1V

(c) III > II > IV > I

(d) II > IV > I > III

46.
$$O \xrightarrow{CH_3MgX} Product$$

What is the product?

- (a) Enantiomer
- (b) Diastereoisomer(c) Meso
- (d) Achiral

47.
$$RMgX \xrightarrow{\text{(i) CH}_3CN} (A) \xrightarrow{RMgX} (B)$$
, (B) will be:

- (a) 1° ROH
- (b) 2°ROH
- (c) 3° ROH
- (d) Alkene

48.
$$(a) CO$$
(b) $^{14}CO_2$
(c) CO_2
(d) A mixture $^{14}CO_2$ and CO_2

LEVEL-2

1. In the given reaction

PhMgBr +
$$D_2O \longrightarrow (X)$$
; (X) will be:

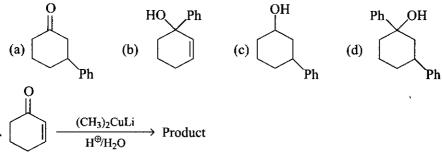
a) $\langle O \rangle$ —OD (c) $\langle O \rangle$ —I

2. Find the product of the following reaction

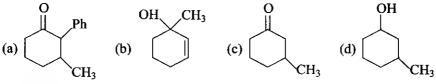
$$\begin{array}{ccc} {\rm CH_3CH_2MgBr+HgCl_2} & \longrightarrow & (X); (X) \, {\rm will \, \, be}: \\ {\rm (a) \, \, (CH_3CH_2)_2Hg \, (b) \, \, CH_3CH_3} & {\rm (c) \, \, CH_3CH_2Cl} & {\rm (d) \, \, CH_3CH_2HgCl} \\ {\rm O} \end{array}$$

3.
$$\xrightarrow{\text{PhMgBr}} \text{Product}$$

Identify the structure of product:



Identify the structure of product:



5. Find the product of the following reaction

$$H_2C$$
 CH CH_2 $Br + Mg \xrightarrow{Et_2O} A \xrightarrow{H$ H Br, hv Br

Find out 'B':

(a)
$$HO - H_2C - CH_2 - CH_2 - Br$$
 (b) $HO - CH_2 - CH - CH_3$

Br

(c)
$$HO-H_2C-CH=CH_2$$

(c)
$$HO-H_2C-CH=CH_2$$
 (d) $Br Mg CH_2-CH=CH_2$

6. H—C—C—H
$$\xrightarrow{\text{CH}_3\text{MgBr (excess)}}$$
 Product :

7.
$$CH_3MgBr (1 Mole)$$
 Product:

$$(a) \times OH O (b) \times O (c) \times OO$$

8. Find the product of the following reaction,

$$\begin{array}{c}
O \\
\xrightarrow{\text{Me}_2\text{CuLi}} & \text{Product} :
\end{array}$$

$$(d) \bigcirc C - CH_3$$

9. Find the product of the following reaction,

$$\xrightarrow{\text{Br}} \xrightarrow{\text{Li}} A \xrightarrow{\text{Cul}} B$$

Find out the final product (C):

(b)
$$\sim$$
 CH=CH—CH₃

(d) None of these

10. In the given reaction

$$\begin{array}{c}
 & \xrightarrow{\text{H}_3\text{CMgBr}} \text{Product} \\
 & \xrightarrow{\text{H}^{\oplus}/\text{H}_2\text{O}}
\end{array}$$

Find the product of reaction:

(a)
$$\rightarrow$$
 OH (b) \succ (c) \rightarrow OH

11.
$$OH \xrightarrow{SOCl_2} OH \xrightarrow{Bl_2O} OH \xrightarrow{Pyridine} OH \xrightarrow{Et_2O} OH \xrightarrow{Pyridine} OH \xrightarrow{SOCl_2} OH \xrightarrow{Pyridine} OH \xrightarrow{Pyrid$$

Product of reaction is:

12. The end product of the following reaction is:

$$O \xrightarrow{O} \xrightarrow{H_3CMgBr} \xrightarrow{PhMgBr} \xrightarrow{H_3^{\oplus}O} \xrightarrow{Product}$$

(a) α, β-diketone

(b) α-hydroxy acid

(c) 1, 2-diol

(d) β-hydroxy acid

Ph PhMgBr
$$A \xrightarrow{\text{HClO}_4} B$$

Find out the final product 'B':

14.
$$A \xrightarrow{\text{Br}_2/\text{hv}} B \xrightarrow{\text{Mg, } \Delta} C \xrightarrow{\text{Et}_2\text{O}} C \xrightarrow{\text{Et}_3\text{O}} D \xrightarrow{\text{Conc. H}_2\text{SO}_4} E \xrightarrow{\text{O}_3} E \xrightarrow{\text{Zn/H}_2\text{O}}$$

Find out the structure of 'A':

(a)
$$\bigcirc$$
 (b) \bigcirc (c) \bigcirc (d) \bigcirc

15.
$$N=C=O \xrightarrow{H_3C-CH_2MgBr} P \xrightarrow{1. CH_3CH_2O} Q$$

Find out
$$P$$
 and Q :

OH

O—CH₃

O(a) P is Ph—N=C—CH₂CH₃ and Q is Ph—N=C—CH₂CH₃

(b)
$$P$$
 is Ph—NH—C—CH $_2$ CH $_3$ and Q is Ph—N—C—CH $_2$ CH $_3$

(c)
$$P$$
 is Ph—NH—C—CH₂CH₃ and Q is Ph—N=C—CH₂CH₃
OCH₃

(d) P and Q both are same

16. Ph—C—C—Ph
$$\xrightarrow{\text{H}_3\text{CMgBr}}$$

How many products will be obtained and how many can be separated by fractional distillation method?

- (a) 3, 3
- (b) 2, 3
- (c) 3, 2
- (d) 2, 2
- 17. Which of the following reactions will give 2° chiral alcohol as major product?

(a)
$$Fh \xrightarrow{i} MgI \xrightarrow{O_2} \xrightarrow{H_3O} CH_3$$

$$\begin{array}{c|c}
O & & \oplus \\
 & \parallel & & H_3O
\end{array}$$
(b) CH₃MgI + H—C—O—CH₂CH₃ $\xrightarrow{\text{H}_3O}$



(c)
$$Ph \longrightarrow H MgBr + H_2C \longrightarrow CH_2 \xrightarrow{H_3O} \longrightarrow CH_3 \xrightarrow{\oplus} (d) PhMgBr + CH_3 \longrightarrow C \longrightarrow Ph \longrightarrow (d) PhMgBr + CH_3 \longrightarrow C \longrightarrow Ph \longrightarrow (d) H_3O \longrightarrow H_3O \longrightarrow$$

The final product of the reaction is:

24.
$$H_3CMgBr (1 Mole) \rightarrow Produc$$

Find the structure of product:

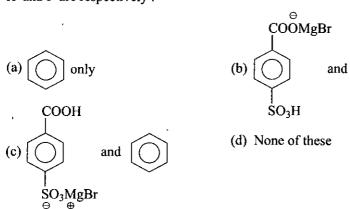
25.
$$Cl \xrightarrow{Mg/THF} (P)$$

Identify (P):

(a)
$$\longrightarrow$$
 (b) \longrightarrow $MgCl$ (c) \longrightarrow $MgCl$ \longrightarrow \longrightarrow $MgCl$ \longrightarrow \longrightarrow $MgCl$ \longrightarrow MgC

•

X and Y are respectively:



MgCl

27.

(a)

Find out the value of X':

(b)

(c)

29.
$$PhMgBr (1 Mole) \rightarrow Product (P) :$$

$$(a) \qquad Ph \qquad (b) \qquad O$$

(d) None of these

30. Cl—C—Cl
$$\xrightarrow{\text{PhMgBr (excess)}}$$
 (X); Product (X) is:

(d) Ph-

(excess)

$$\begin{array}{c} OH \\ | \\ (d) \ H_3C--C-CH_3 \\ | \\ CH_3 \end{array}$$

32.
$$\underbrace{\frac{\text{PhMgBr}}{\text{H}_{3}^{\oplus}\text{O}}}_{\text{O}} X \xrightarrow{\text{Conc. H}_{2}\text{SO}_{4}} Y$$

Identify 'Y':

33.
$$H_3C$$
 CH_2
 CH_3
 CH_3CH_3
 CH_3CH_3
 $CH_3CH_3CH_3$

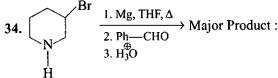
How many products will be obtained and what is the relationship between them?

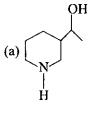
(a) 2 and enantiomers

(b) 3 and all are diastereomers

(c) 2 and diastereomers

(d) 3 and all are homomers





35. Which of the following compounds is not suitable solvent for Grignard reagent?

(p)
$$\binom{0}{0}$$

(d)
$$\nearrow^{O} \searrow^{O} \nearrow$$

Find the major product:

37. Cl—C—OEt
$$\xrightarrow{\text{PhMgBr (excess)}} \text{Product}$$
:

38.
$$\xrightarrow{\text{Ph}} \xrightarrow{\text{Mg}} X \xrightarrow{\text{HCHO}} Y;$$

Product 'Y'is:

(d) None of these

39. PhMgBr + H_3C —C=N $\xrightarrow{H_3^{\oplus}O}$ Product :

(c)
$$H_3C$$
 CH_3 (d) Ph

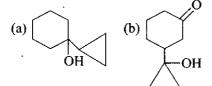
Products obtained in the reaction are:

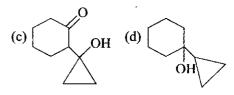
(a) Meso

(b) Racemic

(c) Homomer

- (d) Diastereomer
- 41. $OH \xrightarrow{(1) \text{ PhMgBr}} (A)$; Product (A) in this reaction is :





- 42. Which alkyl halide will react fastest with aqueous methanol?
 - (a) Me₃C—Br

(b) Me₃C—Cl

(c) Me₂CH—Br

(d) CH₃—CH₂—CH₂—Br

43.
$$H_3C$$
— $\overset{\ominus}{=}$ $Na^{\oplus} + CH_3CH_2$ — X \longrightarrow

The reaction is fastest when X is:

(a) ---OH

(b) —F

(c) —O—C—CF₃

(d) —O—C—CH

- 44. When the concentration of alkyl halide is triple and concentration of OH is reduced to half, the rate of S_V² reaction increased by:
 - (a) 3 times
- (b) 1.5 times
- (c) 2 times
- (d) 6 times
- 45. The compound which undergoes fastest reaction with aq. NaOH solution is:

(c)
$$C_6H_5$$
— CH_2 — CH_2 — C

(a)
$$C_6H_5$$
— CH — OCH_3 (b) C_6H_5 — CH — CH_3 (c) C_6H_5 — CH_2 — CH_2 — CI (d) C_6H_5 — CH — CH_2 CH $_3$

46. The rate of S_N reaction is fastest with:

Вг

(b)
$$\langle CH - CH - CH_2 - B \rangle$$
(d) $\langle CH_2 - B \rangle$

47. In the following reaction the most probable product will be:

$$(a) \begin{array}{c} H \xrightarrow{C} H_3 \xrightarrow{OH} \\ H_3C \xrightarrow{H} H \xrightarrow{C} H_3 \xrightarrow{OH} \\ C_2H_5 \end{array}$$

$$(b) \begin{array}{c} CH_3 \\ H \xrightarrow{C} H_3 \\ H_3C \xrightarrow{H} H \end{array}$$

$$(c) \begin{array}{c} C_2H_5 \\ H_3C \xrightarrow{H} H \end{array}$$

$$(d) \begin{array}{c} CH_3 \\ HO \xrightarrow{H} H \\ H_3C \xrightarrow{H} H \end{array}$$

48. The following reaction is described as:

$$\begin{array}{c}
 & & \\
 & \text{OH} \\
\end{array}$$

$$\begin{array}{c}
 & \text{OH} \\
\end{array}$$

$$\begin{array}{c}
 & \text{OH} \\
\end{array}$$

- (a) S_N 1 reaction with racemisation
- (b) Intramolecular S_N^2 reaction with walden inversion
- (c) Intramolecular S_N^2 reaction with retention of configuration
- (d) Intramolecular S_N^2 reaction with racemisation
- 49. In the following reaction find the correct product:

(a)
$$H \longrightarrow C_2H_5$$
 (b) $H \longrightarrow C_2H_5$ (c) $H \longrightarrow C_2H_5$ (d) $H \longrightarrow C_2H_5$ (d) $H \longrightarrow C_2H_5$ (e) $H \longrightarrow C_2H_5$ (f) $H \longrightarrow C_2H_5$ (f) $H \longrightarrow C_2H_5$ (g) $H \longrightarrow C_2H_5$ (g)

51. The correct decreasing order of relative reactivity of the following chlorides toward aqueous KOH solution:

(a) P > Q > R > S (b) R > P > Q > S (c) S > R > Q > P (d) R > S > Q > P

52. The relative reactivity of following halides toward S_N^2 reaction follows the order:

(a) Q > S > R > P (b) P > S > R > Q (c) S > R > Q > P (d) P > R > S > Q

53. Rate of S_N 1 reaction is:

54. In the following compound, arrange the reactivity of different bromine atoms toward NaSH in decreasing order:

$$\operatorname{Br}(S) \xrightarrow{\operatorname{Br}(Q)} \operatorname{Br}(P)$$

(a) P > Q > R > S (b) S > Q > P > R (c) Q > S > P > R (d) P > S > Q > R

55. Rate of reaction with aqueous ethanol follows the order:

(a) P > Q > S > R (b) Q > P > R > S (c) P > R > Q > S (d) R > P > S > Q

56. The reactivity of PhMgBr with the following compounds is:

PhOH
$$CH_3CHO$$
 $R-C\equiv CH$ $H_3C-C=C$ \parallel O

(a) P > Q > R > S (b) S > R > Q > P (c) P > R > S > Q (d) R > P > Q > S

 \Rightarrow Arrange the following in decreasing order of S_{N^2} reaction (From question no. 57-65).

57. CH₃Cl CH₃CH₂Cl CH₃CH₂Cl₂Cl CH₃-CH-CH₃
(a)
$$P > Q > S > R$$
 (b) $P > Q > R > S$ (c) $S > R > Q > P$ (d) $S > Q > R > P$

58. Cl
(P) (Q) (R) (S)
(a) $P > Q > R > S$ (b) $R > P > Q > S$ (c) $Q > R > P > S$ (d) $R > Q > P > S$

59. Cl
(P) (Q) (R) (S)

(S)(a) S > R > P > Q (b) S > R > Q > P (c) R > S > Q > P (d) S > P > R > Q

60.
$$(P)$$
 (Q) (R) (S) (S)

(R)

(Q)

(a) P > R > S > Q (b) P > Q > R > S (c) P > R > Q > S (d) R > Q > S > P

61. Cl

Cl

(P) (Q) (R) (S)

(a)
$$P > Q > R > S$$
 (b) $Q > P > S > R$ (c) $Q > P > R > S$ (d) $R > S > Q > P$

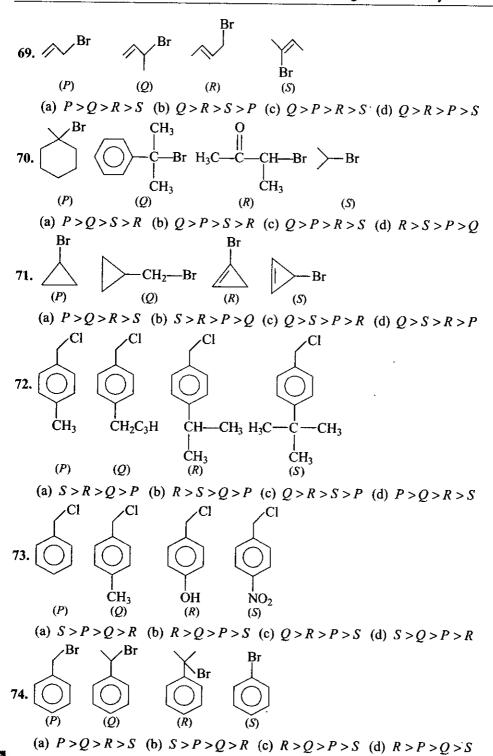
62. \bigcirc_{Br} \bigcirc_{Br} \bigcirc_{Br} $\bigcirc_{H_3C \longrightarrow Br}$ $\bigcirc_{H_2C \longrightarrow CH \longrightarrow Br}$

(P) (Q) (R) (S)

(a) $S > P > Q > R$ (b) $Q > S > R > P$ (c) $Q > R > P > S$ (d) $R > Q > P > S$

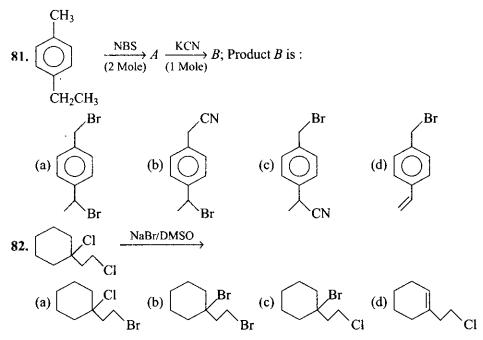
63. $\bigcirc_{H_3C \longrightarrow CH_2 \longrightarrow Cl}$ $\bigcirc_{H_3C \longrightarrow Cl}$ $\bigcirc_$

(a) S > Q > P > R (b) S > P > Q > R (c) Q > P > S > R (d) S > R > Q > P





*



83. The reaction

$$H_{M_{M_{1}}}OH$$
 + SOCl₂ \longrightarrow $H_{M_{1}}Cl$ + SO₂+ HCl

proceed by the mechanism:

- (a) $S_N 1$
- (b) $S_N 2$
- (c) $S_E 2$
- (d) S_N^i

84. The reaction

$$H_{M}OH + SOCl_2 \longrightarrow Cl_{M}H + SO_2 + HCl_2$$

proceed by the mechanism:

- (a) $S_N I$
- (b) S_N^2
- (c) S_E
- (d) S_N^i

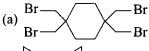
85. Consider the following reaction

$$\begin{array}{c}
 & \text{Fig. 1.1} \\
 & \text{Br} & \text{H}
\end{array}$$

Which of the following products is not expected to form?

86. The product formed in the reaction:

$$\begin{array}{ccc} Br & Br & Na \\ Br & Br & ether, \Delta \end{array}$$



(b)
$$B_{I}$$
 B_{I}

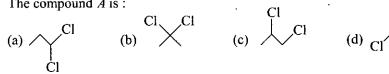


(d)
$$\nearrow$$
 \xrightarrow{Br}

87. Consider the following sequence of reactions

$$\begin{array}{c} A \\ C_3 H_6 \text{Cl}_2 \end{array} \xrightarrow{\text{alc. KOH}} B \xrightarrow{\begin{array}{c} B_2 H_6 \\ H_2 O_2 / \text{OH} \end{array}} C; A \xrightarrow{\begin{array}{c} \text{aq. KOH} \\ \Delta \end{array}} C.$$

The compound A is:



88. Which of the following reactions will go faster if concentration of nucleophile is increased?

(a)
$$\nearrow$$
 Br + KCN $\xrightarrow{\text{EtOH}}$

(b)
$$\longrightarrow$$
 + CH₃COON_a $\xrightarrow{\text{CH}_3\text{COOH}}$

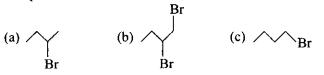
(c)
$$\rightarrow$$
 Br + H₂O \longrightarrow

(d)
$$Ph$$
 CH — $Br + H_2O$ \longrightarrow

89. Consider the following sequence of reaction

$$\begin{array}{c}
 & \xrightarrow{\text{CH}_3\text{CH}_2\text{MgBr}} A \xrightarrow{\text{PBr}_3} B
\end{array}$$

The product B is:



90.
$$CI \xrightarrow{AgNO_3} Product$$

Find the product:







91. The order of decreasing nucleophilicities of the following species is:

- (a) $CH_3 \overset{\Theta}{S} > CH_3 \overset{\Theta}{O} > CH_3 CO\overset{\Theta}{O} > CH_3 OH$
- (b) CH₃COO>CH₃S>CH₃O>CH₃OH

(c)
$$CH_3OH > CH_3 \stackrel{\Theta}{S} > CH_3COO > CH_3 \stackrel{\Theta}{O}$$

92. The order of decreasing nucleophilicity of the following is:

(a)
$$\text{H}_2\text{O} > \overset{\ominus}{\text{OH}} > \text{CH}_3\text{COO} > \text{CH}_3\overset{\ominus}{\text{O}}$$
 (b) $\text{CH}_3\overset{\ominus}{\text{O}} > \overset{\ominus}{\text{OH}} > \text{CH}_3\text{COO} > \text{H}_2\text{O}$

(c)
$$CH_3COO > CH_3O > OH > H_2O$$
 (d) $OH > CH_3O > CH_3COO > H_2O$

93. Consider the following nucleophiles

when attached to sp^3 -hybridized carbon, their leaving group ability in nucleophilic substitution reactions decreases in the order:

(a)
$$I > II > III > IV$$

(b)
$$I > II > IV > III$$

(c)
$$IV > I > II > III$$

(d)
$$IV > III > II > I$$

94. Find the product of the following reaction:

(a)
$$(b)$$
 (c) (d) (d)

95. Find the product of the following reaction:

$$(a) \xrightarrow{OCH_3} (b) \xrightarrow{OCH_3} (c) \xrightarrow{(d)}$$

96. Find the major product of the following reaction:

(a)
$$(b)$$
 (c) (d) (d)

97. Find the major product of the following reaction:

(a)
$$OC_2H_5$$
 (b) OC_2H_5 (c) OC_2H_5 (d) OC_2H_5

98. Find the major product of the following reaction:

$$\begin{array}{c|c} & & & \\ & & & \\ & & & \\ \text{(a)} & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & \\ & & & \\ & &$$

99. Which of the following reactions is not feasible?

(a)
$$CH_3OH$$
 (b) $Br \xrightarrow{C_2H_5OH}$ CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_4 CH_5 C

100. Find the major product of the following reaction:

$$(a) \xrightarrow{Cl} \xrightarrow{CH_3OH} CH_3$$

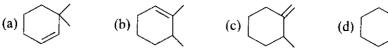
$$(b) \nearrow (c) \nearrow (d) \xrightarrow{OCH_3}$$

101. Find the major product of the following reaction:

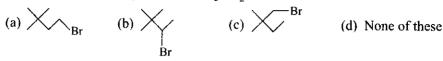
102. Find the major product of the following reaction:

;

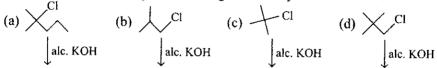
$$\begin{array}{c}
C_2H_5OH \\
\Delta
\end{array}$$
Br



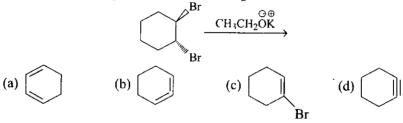
103. Which of the following cannot undergo E_2 reaction?



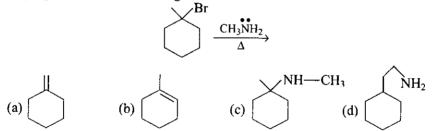
104. In which of the following reactions, regioselectivity can be observed?



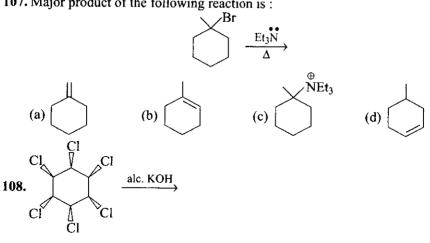
105. The most probable product in the following reaction is:



106. Major product of the following reaction is:



107. Major product of the following reaction is:



(a)
$$Cl$$
 (b) Cl (c) Cl (d) No reaction

109. Which of the following will undergo fastest elimination with alcoholic KOH?

(a)
$$CH_3$$
 (b) CH_3 (c) CH_3 CH

110. Which of the following is β -elimination reaction?

(a)
$$HO$$
 $Br + NaOH \longrightarrow O$
(b) $CHBr_3 + Me_3CO^{\ominus}K^{\oplus} \longrightarrow CBr_2$

(c) $H_3C - C - Br + KOH (alc.) \longrightarrow CH_3$
(d) Br
 $OH + NaOH \longrightarrow OH$

111. Arrange the following in decreasing order of E_2 reaction:

112. Which of the following reactions will undergo an elimination reaction and an alkene will be formed in the product?

$$(a) \qquad Br \qquad Br \qquad Br \qquad Br \qquad OH, \Delta$$

$$(b) \qquad Me \qquad Me \qquad OH, \Delta$$

$$(c) \qquad Conc. H2SO4 \qquad (d) \qquad OH, \Delta$$

113.
$$\underbrace{\begin{array}{c} E_2 \\ \hline \\ X \end{array}}$$
 elimination Saytzeff Hofmann product

In the above reaction, maximum Saytzeff product will be obtained where X is:

- (b) ---Cl
- (c) —Br
- (d) —F

114. In the above reaction (Question no. 113) Hofmann product is major when base is:

- (a) CH₃[⊖]O
- CH₃

115. Find the major product of the reaction:

- (d) Both (a) and (b)

 $\xrightarrow{\Delta}$ Major product : 116. [⋩]CH₃

- (d) None of these

 $\xrightarrow{\Delta}$ Major product: 117. CH₃

/Me

- (d) None of these

 $\xrightarrow{OH} Major product :$ 118.

- (a)
- (b)

 CH_3 . Br



120.
$$Ph \longrightarrow H$$
 Br CH_3 $Alc. KOH \longrightarrow Major product :$

121.
$$D \xrightarrow{CH_3} H \xrightarrow{NaNH_2} Major product :$$

$$(a) \stackrel{H_3C}{\longrightarrow} \stackrel{CH_3}{\longrightarrow} (b) \stackrel{H_3C}{\longrightarrow} \stackrel{D}{\longrightarrow} \stackrel{CH_3}{\longrightarrow} (c) \stackrel{D}{\longrightarrow} \stackrel{CH_3}{\longrightarrow} (d) \stackrel{H_3C}{\longrightarrow} \stackrel{D}{\longrightarrow} CH_2$$

122. Identify the major product of the reaction:

CH₃

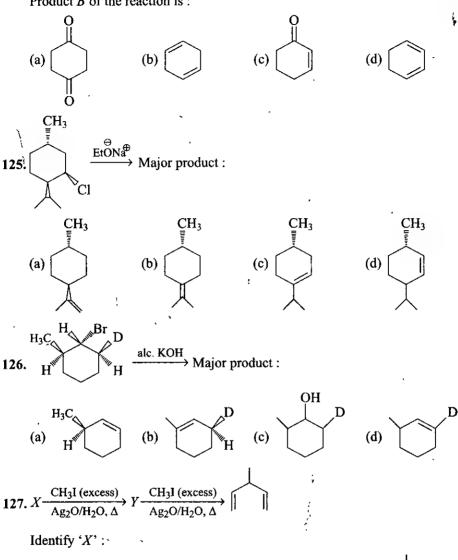
$$\begin{array}{c}
 & \stackrel{CH_3}{\searrow} \\
 & \stackrel{N}{\searrow} & \stackrel{PhCO_3H}{\searrow} \\
 & (c) \ H_2C = CH_2 \quad (d) \\
 & \stackrel{CH_3I}{\searrow} & X \xrightarrow{AgOH, \Delta} X \xrightarrow{AgOH, \Delta} Y \\
 & \downarrow \\
 & CH_3
\end{array}$$

Identify the major product Y:

(a) (b) (c)
$$\bigoplus_{\text{NMe}_3}$$
 (d) \bigoplus_{NMe_3}

OH O
$$CH_3 - C - C1(2 \text{ Mole}) \longrightarrow X \longrightarrow B + CH_3COOH$$
OH
OH

Product B of the reaction is:



(c)

128.
$$(CH_3)^{OH} \xrightarrow{KH} X \xrightarrow{CH_3I} Y \xrightarrow{\Delta} Z$$

Product (Z) is:

(a)

129.
$$\xrightarrow{\mathbb{R}}$$
 Br $\xrightarrow{Z_{n,\Delta}}$ Major product :

(d) None of these

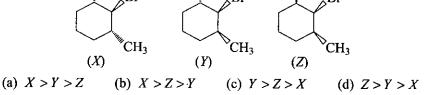
130.
$$Ph$$
 Cl Zn,Δ CH_3 CH_3

131.
$$H_3C$$
 Cl CH_3 Δ Δ

(b)
$$Ph$$
 $C=C$ Ph

132.
$$H_3C$$
— CH_2 — H
 \oplus
 NMe_3
 Ag_2O/H_2O
 Δ
Major product :

137. Arrange the following in decreasing order of E_2 reaction:



 CH_3

138. Which of the following is the correct option of reagent for the given conversion?

$$CH_4 \longrightarrow \longrightarrow COOH$$

- (a) Br_2/hv , MgCl, Br_2/hv , HCOOH
- (b) Cl₂/hv, MgCl, Br₂/hv, KCN/H₃ O

1,ŧ .

- (c) Br_2/hv , $\bigwedge MgCl$, Br_2/hv , $NaNH_2$, HCN, $H_3^{\oplus}O$
- (d) Cl₂/hv, CH₃MgBr, Br₂/hv, CH₃COOH

$$139. \bigcirc CI \longrightarrow H \bigcirc O$$

Which of the following is the correct option of reagent for the above conversion?

- (a) Mg/Et $_2$ O, CH $_3$ Cl, Br $_2$ /hv, alc. KOH, KMnO $_4$ /OH, Δ
- (b) OH, H_2SO_4/Δ , O_3/Zn , H_2O
- (c) CH₃MgBr, Br₂/hv, alc. KOH, KMnO₄, Δ
- (d) Mg/Et₂O, CH₃Cl, Br₂/hv, alc. KOH, O₃/Zn, H₂O

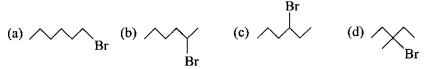
140.
$$\rightarrow$$
 Br $\xrightarrow{\text{CH}_3\text{OH}}$ $\xrightarrow{\text{CH}_3\text{OH}}$

(a)
$$\searrow^{OCH_3}$$
 (b) \searrow^{CH_3} (c) \searrow^{OCH_3} (d) \swarrow

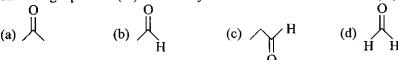
141.
$$A (C_6H_{13}Br) \xrightarrow{1. \text{ Mg/Ether}} n\text{-hexane.}$$

$$Na/Ether \longrightarrow 4, 5\text{- diethyloctane}$$

Deduce the structure of 'A':

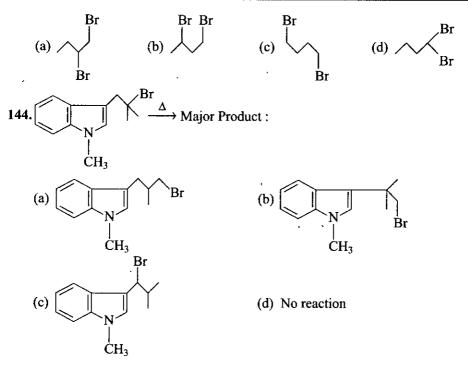


142. Treatment of 2-bromobutane with hot alcoholic KOH gives a mixture of three isomeric butenes (A), (B) and (C). Ozonolysis of the minor product (A) gives HCHO and another aldehyde in equimolar amounts. Both (B) and (C) gave the same single product (D) on ozonolysis. Find structural formula of (D):

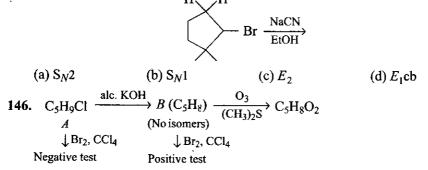


143.
$$A (C_4H_9Cl) \xrightarrow{\text{alcoholic KOH}} B \xrightarrow{\text{Br}_2/CCl}_4 C \xrightarrow{\text{NaNH}_2} D \xrightarrow{\text{[Ag(NH}_3)_2]}^{\bigoplus} \text{ppt.}$$

Find structure of C':



145. Find the nature of following reaction:



which of the following is the structure of A?

(a)
$$Cl$$
 (b) Cl (c) Cl (d) Cl

147. Consider the following reaction

Ph
$$H \xrightarrow{K_2CO_3} Major product :$$

148. Which reaction take place at the fastest rate?

(a)
$$Cl \xrightarrow{NaSH} C_2H_5OH, 25^{\circ}C$$
 SH

(b) $Cl \xrightarrow{NaSH} C_2H_5OH, 25^{\circ}C$ SH

(c) $NaSH \longrightarrow SH$
 $Cl \xrightarrow{NaSH} C_2H_5OH, 25^{\circ}C$ SH

(d) $NaSH \longrightarrow SH$
 $Cl \xrightarrow{NaSH} C_2H_5OH, 25^{\circ}C$

149. What are reactant X and product Y in the following sequence of reactions?

150. What is the major product of following reaction?

$$CH_3 \rightarrow CHLi + CH_2 = CH_2 \xrightarrow{CO_2} H^{\oplus}/H_2O$$

151. Find the major product of following reaction:

153. Identify the major product of following reaction:

$$C \equiv N$$
 $MgBr$
 H_3CO
 NEt_3
 H^{\oplus}/H_2CO

154. Identify the major product of following reaction:

(a) (b)
$$CH_3$$
 CH_3 CH_3

155. Find the major product of following reaction:

$$H_3CO$$
 H_3CO
 H_3CO

156. Predict the major product of given reaction:

$$(a) \begin{picture}(200,0) \put(0,0){\oolding} \put(0,0){\ool$$

7

157. Predict the major product of given reaction:

(b)
$$\sim$$
 S \sim CH₃ \sim CH₃

158.
$$O$$
 H^{\oplus}/H

$$\xrightarrow{\text{2CH}_3\text{MgBr}}$$
 Major product :

(d) No reaction

159. Ph—CH=N—CH₃ + Ph—CH₂MgCl $\xrightarrow{\text{H}_2\text{O}}$ Major product :

(b)
$$Ph$$
— CH_2 — N — CH_3

$$CH_2Ph$$

(c) Ph—CH—CH₂Pl H₃C—NH (d) None of these

160. Find the major product of following reaction:

161. Find major product of following reaction:

$$H_3C$$
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3

(a)
$$H_3C$$
 $C=C-C$ (b) H_3C $C=C-C$ Br CH_3 (c) H_3C $C=C-C$ CH_3 (d) None of these CH_3

162. Predict the major product of following reaction:

$$\begin{array}{c|c} & & & & \\ & & & & \\ & & & \\ Br & & & \\ & & & \\ Br & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & \\ & & & \\ & &$$

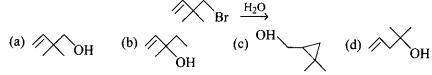
163. Predict the major product of following reaction:

$$\begin{array}{c|c}
O \\
S \\
OPh \\
OPh \\
OC_2H_5
\end{array}$$

ij

(d) No reaction

164. Identify the major product of following reaction:



165. Find out the major product of following reaction:

(a)
$$CH_3$$
 $C-OH$

O

CH₃ $C-OH$

O

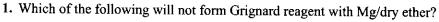
CH₃

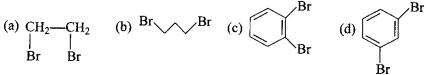
(b) $C-C-CH_3$

(c) CH_3

(d) No reaction

EXERCISE-2 MORE THAN ONE CORRECT ANSWERS





- 2. Which of the following will not give addition reaction with RMgX?
 - (a) CO₂

(b) CH_3 — CH_2 —Br

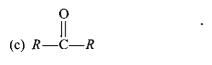
(c) SO₂

(d) CH₃—C—OH

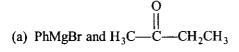
3. In the given reaction,

$$(X) + RMgX \text{ (excess)} \xrightarrow{H^{\oplus}/H_2O} 3^{\circ} \text{ Alcohol}$$

(X) may be:



4. Which of the following combinations give C_6H_5 —C—OH? CH_3 CH_3 CH_3 CH_3

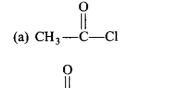


(b)
$$CH_3MgBr$$
 and Ph — C — CH_2CH_3

(c) CH₃MgBr and
$$C_6H_5$$
—C—O C_2H_5

(d)
$$CH_3CH_2MgBr$$
 and Ph — C — CH_3

5. Which of the following compounds will give acid base reaction with RMgX?





- 6. Find out correct statements about Grignard reagent:
 - (a) The C—Mg bond of the Grignard reagent is covalent but highly polar carbon being positive relative to electronegative Mg
 - (b) RMgX give nucleophilic addition with carbonyl compound
 - (c) RMgX give 3° alcohol on reaction with esters
 - (d) RMg x give nucleophilic addition elimination reaction with acid derivative

7.
$$R \longrightarrow X + Mg \xrightarrow{\text{ether}} R \longrightarrow MgX \xrightarrow{\text{CH}_3\text{OH}} n\text{-butane}$$

What can be R in the above reaction sequence?

(a) n-propyl

(b) n-butyl

(c) sec-butyl

(d) Isopropyl

8. Point out the following incorrect Grignard synthesis:

(a)
$$Product E$$
 is $Product E$ is

10. Which of the following reactions are correct?

(a)
$$C = CH_3MgBr$$
 H_2O $C = C-CH_3$

(b) $C = N$ CH_3MgBr CH_3 CH_3

(c)
$$CH_3$$
— C — $Cl \xrightarrow{PhMgBr} CH_3$ — C — Ph

(d) PhMgBr
$$\xrightarrow{CO_2}$$
 Ph—C—OH

11. Which of the following compounds give alcohol on reaction with RMgX?

(a)
$$O_2$$
 (b) R —C—H (c) R —O—H (d) $\angle O$

12. Which of the following ketone does not react with CH₃MgBr?

(a)
$$CH_3$$
— C — CH_3

(b) CH_3
 CH_3

13.
$$R$$
—C—CI + Z — R —C— R

The reagent Z is:

(a) R₂CuLi

(b) R_2 Cd

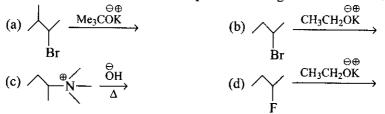
(c) $(Ph_3P)_3RhCl$

(d) H₂---Pd/BaSO₄

14.
$$OOH \longrightarrow X \longrightarrow X \longrightarrow Y \longrightarrow Z$$
; then:

(c)
$$Y$$
 is O OMgBr OMgBr

- 15. \longrightarrow Br $\xrightarrow{I. L_1} X \xrightarrow{Y} 2$, 7-dimethyl; then:
 - (a) X is \bigvee_{CuLi} (b) X is \bigvee_{2} CuLi(c) Y is \bigvee_{Br} (d) Y is \bigvee_{Br}
- 16. Choose the correct among the following statements:
 - (a) \sqrt{I} will react more readily than \sqrt{I} for S_N^2 reaction
 - (b) \nearrow Cl will react more readily than \nearrow Br for S_N^2 reaction
 - (c) \nearrow Br will react more readily than \nearrow Br for S_N^2 reaction
 - (d) \sim CH₂Br will react more readily than \sim Br for S_N2 reaction
- 17. In which product formation takes place according to Hofmann's rule?

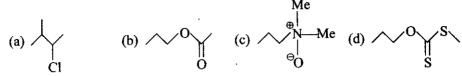


- 18. Consider the following statements and pick up the correct statements:
 - (a) MeO CH₂—Br will react more readily than O_2N CH_2Br for S_N^1 reaction

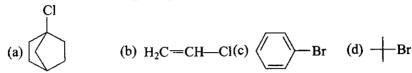
 Br

 (b) will react more readily than Cl(c) will react more readily than Cl Cl
 - (d) S_{N^1} reaction occurs in polar protic solvent

19. Which of the following compounds will give syn-elimination reaction?



20. Which of the following compounds will not give S_N^2 reaction?



21. Which of the following compounds will give S_N 1 reaction?

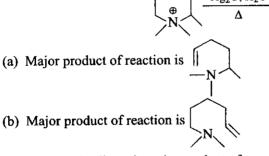
(a)
$$H_3C$$
— CH_2 — Br

(b) \swarrow — Br

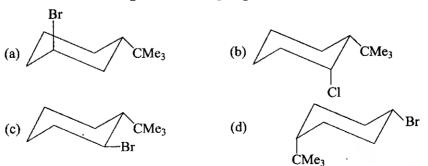
(c) H_3C — O — CH_2 — Cl

(d) H_3C — I — CH_2CH_2

22. Which of the following are correct for the given reaction?



- (c) Hofmann's alkene is major product of reaction
- (d) Reaction is unimolecular
- 23. Which of the following halides undergo E_2 elimination?



24. In which of the following cases, the major product has been correctly shown?

(a)
$$\xrightarrow{\text{H}_2\text{O}}$$
 (b) $\xrightarrow{\text{Me}_3\text{CO}^{\Theta}\text{K}^{\Theta}}$ (c) $\xrightarrow{\text{Br}}$ $\xrightarrow{\text{EtO}^{\Theta}}$ (d) $\xrightarrow{\text{Br}}$ $\xrightarrow{\text{C}_2\text{H}_5\text{OH}}$

25. Pick the correct orders of reactivity:

26. Which of the following reactions are not feasible?

(a)
$$\underbrace{\begin{array}{c} \text{KNH}_2\\ \text{liq. NH}_3 \end{array}}$$
 (b) $\underbrace{\begin{array}{c} \text{NaNH}_2\\ \text{liq. NH}_3 \end{array}}$ (c) $\underbrace{\begin{array}{c} \text{NaNH}_2\\ \text{liq. NH}_3 \end{array}}$ (d) H_3C

27. Alkyl iodide can be prepared by:

(a)
$$R$$
—CH₂COOAg + I₂ $\xrightarrow{\text{CCl}_4}$ (b) R —CH₂—Cl + NaI $\xrightarrow{\text{acetone}}$ (c) R —OH + HI \longrightarrow (d) CH₄ + I₂ $\xrightarrow{\text{hv}}$

28. Which of the following are S_N^2 reactions?

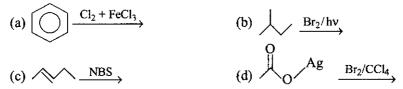
(a)
$$\begin{picture}(c) \begin{picture}(c) \begin{$$

- 29. Which of the following reagents can be used to prepare an alkyl halide from an alcohol?
 - alcohol?
 (a) NaCl
 (b) SOCl₂
 (c) PCl₅
 (d) HCl + ZnCl₂

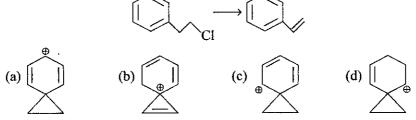


- 30. $H_2C = CH$ —Cl can undergo:
 - (a) addition reaction
 - (b) elimination reaction
 - (c) substitution reaction
 - (d) electrophilic substitution reaction
- 31. Aryl halide undergo:
 - (a) Fittig reaction
 - (b) Ulmann reaction
 - (c) Wurtz reaction
 - (d) Grignard reagent synthesis
- **32.** Which of the following reactions take place by S_N^2 reaction?

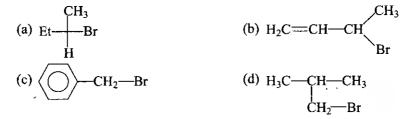
33. Which of the following reactions involve free radical as intermediate?



34. Which of the following are possible intermediate in the following reaction?



35. Which of the following compounds will give racemic mixture by S_{N^1} reaction?



36. Which of the following compounds will give E_1 reaction?

(a)
$$C$$
 CH_2CH_3 (b) Ph CH CH CH CH (c) H_2C CH CH CH CH CH

38.
$$R$$
— CH_2 — CH_2 — $ONa \xrightarrow{CS_2}$ $\xrightarrow{\Delta}$ gives :

(a) R— CH_2 — CH_2 —I

b) R—CH= CH_2

(c) R— CH_2 —SH

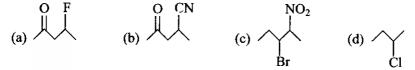
(d) H₃C—SH

39. For the reaction

$$CH_3$$
— CH_2 — CH — CH_3 — OH , Δ
 $Major$
 $Minor$

Choose the correct statements:

- (a) The reaction is E_1 elimination
- (b) The reaction is E_2 elimination
- (c) Transition state has carbanion like character
- (d) Transition state has carbocation like character
- **40.** Which of the following can give E_1 cb reaction?



41. Identify the compounds which may give NGP reaction:

42. Which of the following reactions involve benzyne intermediate?

(a)
$$Cl$$
 KNH_2
 NH_3 (liquid)

(b) Cl
 Mg, THF
 Δ

(c) NH_2
 $NaNO_2 + HCl$
 Δ

(d) CH_3Br
 $AlCl_3$

43. CH_3OH
 C

Which of the following products can be obtained by S_N^1 reaction?

- 44. Among the following pair of reactions in which pair second reaction is more reactive than first for $S_N 1$ reaction?
 - (a) Me_3C — $Cl + H_2O$ and Me_3C — $Br + H_2O$
 - (b) Me_3C — $Cl + CH_3OH$ and Me_3C — $Cl + H_2O$
 - (c) Me_3C — $Cl + H_2O$ and Me_3C — $Cl + H_2O$ (1 M) (2 M)
 - (d) Me_3C — $Cl + CH_3SH$ and Me_3C — $Cl + CH_3OH$
- 45. Which of the following reactions produce the same product?
 - (a) \nearrow $\xrightarrow{\text{Br}_2/\text{hv}}$ $\xrightarrow{\text{Na/Ether}}$ (b) \nearrow $\xrightarrow{\text{COOH}}$ $\xrightarrow{\text{NaOH}}$ $\xrightarrow{\text{Electrolysis}}$ (c) \nearrow $\xrightarrow{\text{Br}}$ (d) $\xrightarrow{\text{COOH}}$ $\xrightarrow{\text{Red P + HI}}$

- 46. Which of the following are correct order of nucleophilicity in CH₃OH?
 - (a) $NH_3 < NH_2 NH_2$

(b)
$$CH_3CH_2O > OH > CH_3 - COO$$

(c) $F^{\ominus} > CI^{\ominus} > Br^{\ominus} > I^{\ominus}$

(d)
$$H_3CO$$
— $\overset{\ominus}{\bigcirc}$ \to H_3C $\overset{\ominus}{\bigcirc}$ $\overset{\ominus}{\bigcirc}$ $\overset{\ominus}{\bigcirc}$

47. Which of the following can give E_1 cb reaction in basic medium?

OH
$$| \qquad \qquad | \qquad \qquad |$$
(a) CH_3 — CH — $C\equiv N$
(b) CI — C — CF_3
(c)
$$| \qquad \qquad | \qquad \qquad |$$
(d) HCF_2 — CCl_3

48. Choose the correct comparison of reactivity toward E_2 reaction:

(a)
$$\langle b \rangle$$
 $\langle b \rangle$ $\langle b \rangle$

49. Which of the following compounds cannot give E_2 reaction with strong base?

(a)
$$(b)$$
 F (c) (d) CH CH Br

50. Which of the following are better leaving group than

EXERCISE-3 LINKED COMPREHENSION TYPE



Passage-1

Optically pure (S) - (+)-2-bromo octane $[\alpha]_D^{25^{\circ}C} = +36^{\circ}$, react with aqueous NaOH in acetone to give optically pure (R) - (-)-2-octanol $[\alpha]_D^{25^{\circ}C} = -10.3^{\circ}$. With partially racemized bromo compound whose $[\alpha]_D^{25^{\circ}C} = 30^{\circ}$, the $[\alpha]_D^{25^{\circ}}$ of the alcohol product is -6.0° .

- 1. Calculate the per cent optical purity of partially racemized bromo compound:
 - (a) 58%

(b) 83%

(c) 70%

- (d) 30%
- 1. Calculate the percentage of racemization:
 - (a) 58%
- (b) 83%
- (c) 70%
- (d) 30%
- 3. Calculate the percentage of frontside attack:
 - (a) 15%
- (b) 85%
- (c) 30%
- (d) 58%

Passage-2

$$R \longrightarrow X + Mg \xrightarrow{\text{Ether, } \Delta} R \xrightarrow{\delta - \delta +} Mg \longrightarrow X$$

Grignard reagents may be prepared from 1°, 2° and 3° halides as well as from vinyl and aryl halide. Vicinal dihalide and those halide which contain acidic tail do not form Grignard reagent.

4. Which of the following halides is most reactive for the preparation of Grignard reagent?







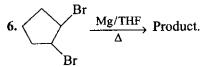


- 5. Which of the following compounds can form Grignard reagent on reaction with Mg/Ether?

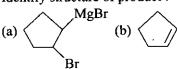
(b) CH_2 —CH— CH_2 —C

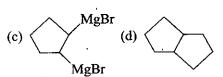


(d) HO Br



Identify structure of product:





Passage-3

Since, Grignard reagents resemble carbanion, so they are strong nucleophile and strong base. Their most useful nucleophilic reaction is addition to carbonyl group.

- 7. Which of the following compounds will not give acid-base reaction with RMg X?

(b) CH₂OH

- (d) H_2S
- 8. Which of the following compounds give racemic mixture on reaction with H₃C---MgBr?

(b) CH₃—C—CH₃

(c) Ph—C—H

- 9. Arrange the following compounds in decreasing order of nucleophilic addition reaction:

$$\begin{array}{c}
O \\
CI - C - CI
\end{array}$$

$$\begin{array}{c}
O \\
C - F
\end{array}$$

$$\begin{array}{c}
O \\
C - F
\end{array}$$

(a) R > P > S > O

(b) P > Q > R > S(d) R > S > P > Q

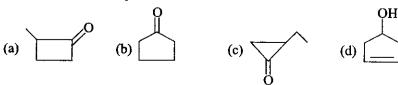
(c) Q > R > S > P

Passage-4

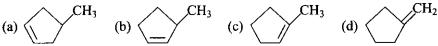
Consider the following sequence of reaction.

$$A \xrightarrow{\text{CH}_3\text{MgBr}} B \xrightarrow{\text{Conc. H}_2\text{SO}_4} C \xrightarrow{\text{H}_2/\text{Pt}} C\text{H}_3$$

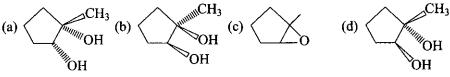
10. Find structure of compound A:



11. Find structure of compound 'C':



12. $C \xrightarrow{\text{CF}_3\text{CO}_3\text{H}} \xrightarrow{\text{H}^{\oplus}/\text{H}_2\text{O}} (X)$; Identify correct structure of (X):



Passage-5

Williamson synthesis is an important method for the preparation of symmetrical and unsymmetrical ether. In this method halide is allowed to react with alcohol in presence of Na or K metal.

$$R$$
—OH + R' — X $\xrightarrow{\text{Na or } K}$ R —O— R'

Mechanism:

$$R \longrightarrow O \longrightarrow H \xrightarrow{\text{Na or}} R \longrightarrow O \text{Na/K} + \frac{1}{2} \text{H}_2 \uparrow$$

$$R \longrightarrow O + R' \longrightarrow X \longrightarrow R \longrightarrow O \longrightarrow R'$$

3° halides and aromatic halides do not give this reaction.

13. Find out the product of the following reaction:

$$OH + CH_{3} - CH_{2} - Br \xrightarrow{NaH \text{ or } KH}$$
(a)
$$OH + CH_{3} - CH_{2} - Br \xrightarrow{NaH \text{ or } KH}$$
(b)
$$O - CH_{2}CH_{3}$$
(c)
$$OH + CH_{3} - CH_{2} - Br \xrightarrow{NaH \text{ or } KH}$$
(d)
$$H_{2}C = CH_{2}$$
14.
$$A + B \xrightarrow{Na} O - CH_{3}$$

Find out A and B:

(a)
$$\bigcirc$$
 Br and CH₃OH (b) \bigcirc OH and CH₃—F (c) \bigcirc OH and CH₃—Br (d) \bigcirc + CH₃OH

15.
$$CH_3CH_2OH + CH_3 - C - CI \xrightarrow{K} Major product :$$

$$CH_3 \longrightarrow CH_3$$
(a) $H_2C = C \longrightarrow CH_3$
(b) $H_3C - C \longrightarrow CH_2CH_3$

$$CH_3 \longrightarrow CH_3$$
(c) CH_3CH_2OK
(d) None of these

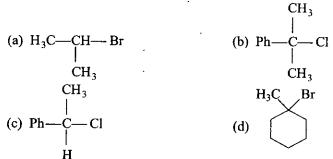
Passage-6

Aliphatic nucleophilic substitution is mainly of two type S_N1 and S_N2 . S_N2 reaction proceed with strong nucleophile in polar aprotic solvent. 3° halides do not give S_N2 reaction. Inverted products are obtained in this reaction and mechanism of reaction occurs through the formation of transition state.

 S_N ¹ reaction proceed through the formation of carbocation in polar aprotic solvent. Solvent itself acts as nucleophile in this reaction. Racemization takes place in S_N ¹ reaction.

16. Which of the following compounds will give S_N 1 reaction?

17. Which one of the following will give racemised product in C₂H₅OH?



18. Which one of the following will give S_{N^2} reaction?

(a)
$$H_3C - C - CI$$
 (b) $CH_2 - C$ (c) CH_3 (d) $H_2C = CH - CI$

Passage-7

Type of elimination reaction in which least substituted alkene is major product known as Hofmann's elimination. Such reaction occur in following conditions:

- (X) when base is bulky
- (Y) when leaving group is very poor such as fluoride, ammonium group ($-NR_3$) etc.
 - (Z) when alkyl halide contain one or more double bonds.
- 19. What is the major product of the following reaction?

20. Which of the following will not produce Hofmann's alkene as major product on reaction with strong base?

(a) F
(b)
$$H_3C \xrightarrow{\oplus} N \longrightarrow CH_3$$
 (c) $H_3C \xrightarrow{\otimes} CH_3$ (d) C1
$$CH_3 \xrightarrow{C} CH_3 \xrightarrow{C_2H_5O^{\ominus}} CH_3 \xrightarrow{C} CH_3$$

0

(a)
$$CH$$
 CH_3 (b) CH_2 CH_3 CH_3 (c) CH_2 CH_3 CH_3 CH_3 CH_3 CH_3 CH_2 CH_2 CH_3 CH_3

Passage-8

There are number of organic compounds including esters, xanthate esters, amine oxides etc., that undergo pyrolytic elimination with heat in the absence of added reagent, either in inert solvent or in the absence of solvent. In general these elimination follow the rate law.

Rate ∝ [Substrate]

However reaction is different from E_1 elimination by the degree of *syn*-stereoselectivity that they exhibit. These reactions are also known as E_1 elimination and the degree of *syn*-stereoselectivity reflect the extent to which they proceed *via* cyclic transition state.

22. Find the major product of the following reaction:

$$(a) \qquad \qquad (b) \qquad (b) \qquad Ph$$

$$(c) \qquad CH_2 \qquad (d) \text{ None of these}$$

Find the structure of product:

24.
$$H \xrightarrow{CH_3} Ph \xrightarrow{O} \xrightarrow{\Delta} Product$$
 $Ph \xrightarrow{H} O - C - CH_3$

Find the major product of reaction:

$$(c) \begin{array}{c} Ph \\ H \end{array} \begin{array}{c} H^2 \\ Ph \end{array}$$

(d) None of these

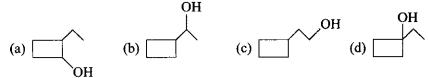
Passage-9

Br
$$\xrightarrow{\text{Mg, }\Delta} A \xrightarrow{\text{CH}_3 - \text{C} - \text{H}} B$$

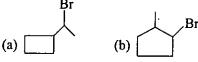
$$\xrightarrow{\text{Conc.}} D \xrightarrow{\text{HBr}} C$$

$$\xrightarrow{\text{Conc.}} D \xrightarrow{\text{B}_2\text{D}_6} E$$

25. Which one of the following is correct structure of 'B'?

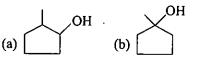


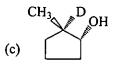
26. Find the major product 'C':

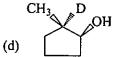




27. Identify the structure of 'E':







MATRIX MATCH TYPE

Column (1)

Column (II)

(a) Ph—C—CH—CH₃
$$\xrightarrow{H^{\oplus}, \Delta}$$
 Ph—CH₃ $\xrightarrow{H^{\oplus}, \Delta}$ Ph—CH₃ $\xrightarrow{$

2. Column (I)

$$(a) \xrightarrow{\text{Ph}} Cl \xrightarrow{\text{KNH}_2} P. \text{ β-elimination}$$

$$(b) \xrightarrow{\text{CH}_3} OH \xrightarrow{\text{SOCl}_2} Q. \text{ S}_N^2$$

$$(c) \xrightarrow{\text{Ph}} N \xrightarrow{\text{CH}_3} NaOH \xrightarrow{\text{NaOH}} R. \text{ α-elimination}$$

$$(c) \xrightarrow{\text{CH}_3} CH_2CH_3$$

$$(d) \text{ H}_3C \xrightarrow{\text{N}} N \xrightarrow{\text{CH}_2CH}_3$$

$$(e) \xrightarrow{\text{CH}_3} CH_2CH_3$$

$$(f) \xrightarrow{\text{CH}_3} CH_2CH_3$$

$$(f) \xrightarrow{\text{CH}_3} CH_3CH_3$$

$$(f) \xrightarrow{\text{CH}_3} SOCl_2$$

$$(f) \xrightarrow{\text$$

3. Column (I)

(a)
$$+ Ph - CH_2 - Cl \xrightarrow{AlCl_3}$$

(b) $+ Ph - Cl \xrightarrow{AlCl_3}$

(c) $+ Cl \xrightarrow{AlCl_3}$

(d) $+ Ph - Cl \xrightarrow{AlCl_3}$

(e) $+ Ph - Cl \xrightarrow{AlCl_3}$

(f) $+ Ph - Cl \xrightarrow{AlCl_3}$

(g) $+ Ph - Cl \xrightarrow{AlCl_3}$

(h) $+ Ph - Cl \xrightarrow{AlCl_3}$

CH₃

4. Column (I)

(a)
$$H \longrightarrow Br$$
 $Eroloope Shape Shape$

5. Column (I)

(a) Ph -CH
$$\xrightarrow{CH_3}$$
 $\xrightarrow{CH_3OH}$ $\xrightarrow{CH_3}$ (b) H_3C — \xrightarrow{C} Br $\xrightarrow{NaNH_2}$ $\xrightarrow{CH_3}$

Column (II)

P. Nucleophilic substitution

Q. Electrophilic substitution

R. Cation intermediate

S. Free radical substitution

Column (II)

P. Anti elimination

Q. Rearrangement

R. Carbocation

S. Transition state

Column (II)

 $P. E_1$

 $Q. E_2$

(c)
$$Ph \longrightarrow H_2S \longrightarrow H_2S$$

R. Ist order kinetics

S. IInd order kinetics

6. Column (I)

Column (II)

(a)
$$H_3C$$
— C — CH_2 — CH — CH_3 — C

$$(b) \xrightarrow{F} \xrightarrow{CH_3CH_2O^{\Theta}K^{\oplus}}$$

Q. Carbocation

(c)
$$\stackrel{\Gamma}{\longleftrightarrow} \stackrel{CH_3CH_2O^{\Theta}Na^{\oplus}}{\longleftrightarrow}$$

 $R. E_2$ elimination

(d)
$$OH \frac{Conc. H_2SO_4}{\Delta}$$

S. Hofmann product

7. Column (I)

Column (II)

P. Inversion

(b)
$$CH_3$$
— CH — Cl $\xrightarrow{\Theta}$ OH (aq.)

Q. Racemisation

(c) Clilling Et
$$CH_2CH_2CH_3$$
 CH_3OH

R. Ist order

(d)
$$H_2C = CH - CH - CI \xrightarrow{\Theta} SH \xrightarrow{Acetone} CH_3$$

S. IInd order

8. Column (1)

Column (II)

(c) PhMgBr +
$$H_3$$
C—C—Cl

$$R$$
. Ph—C—CH₂CH₃

O
$$\parallel$$
 (d) PhMgBr +C₂H₅—C—OC₂H₅

9. Column (I)

Column (II)

(a) PhMgBr + CO₂ $\stackrel{\text{H}_3^{\oplus}\text{O}}{\longrightarrow}$

- P. Nucleophilic addition reaction
- O. Nucleophilic addition elimination reaction

$$\begin{array}{cccc}
O & OH \\
\parallel & \parallel & \parallel \\
(c) CH_3MgBr + Ph - C - OC_2H_5 & \xrightarrow{H_3^{\oplus}O} R. & Ph - C - CH_3 \\
& & CH_3
\end{array}$$

(d) PhMgBr + CH₃—C—CH₃
$$\xrightarrow{\text{H}_3^{\oplus}\text{O}}$$
 S. PhCOOH

10. Column (I)

Column (II)

$$(b) \longrightarrow I \xrightarrow{Cul} \xrightarrow{Br} \xrightarrow{Br}$$

$$R. \rightarrow$$

$$(d) \longrightarrow Cl \xrightarrow{Li} \xrightarrow{CH_3CH_2-Br}$$

11. Column (I)

Column (II)

(a) Ph—C—CH
$$CH_3$$
 CH_3 CH_3OH CH_3

P. No reaction

(b)
$$CH_3 \xrightarrow{CH_3OH} CH_3 \xrightarrow{CH_3OH}$$

Q. Rearrangement

(c)
$$CH_2$$
— CH — CH — CH_3 $\xrightarrow{\Theta}$ $OH (alc.)$

R. Hofmann alkene

(d)
$$CH_3$$
— CH — CH_2 — CH_3 $\xrightarrow{CH_3OH}$ $\xrightarrow{\Delta}$

S. Product can exist in stereoisomeric form

12. Column (I)

(a)
$$Ph \xrightarrow{CH_3} OH \xrightarrow{HBr} CH_3$$

(c)
$$H \longrightarrow OTf \xrightarrow{KCN} H_3C$$

(d)
$$H \rightarrow OH \xrightarrow{SOCl_2}$$
 C_2H_5

Column (IF)

- (P) Nearly total inversion
- (Q) Nearly total retention
- (R) Two step mechanism
- (S) S_N 1 reaction

13. Column (I)

(a)
$$CHCl_2 - CF_3 \xrightarrow{alc. KOH} \Delta$$

(b)
$$\underbrace{\qquad \qquad}_{I} \xrightarrow{aq. KOH}$$

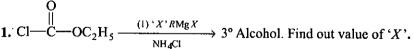
(c)
$$CI$$
 CH_3CH_2O Δ

(d)
$$\xrightarrow{\text{alc. KOH}}$$

Column (II)

- (P) Carbanion
- (Q) Two step process
- (R) Carbocation
- (S) Transition state

EXERCISE-5: INTEGER ANSWER TYPE PROBLEMS



Find out value of X.

3. HO
Cl
$$(1)$$
 'X' PhMgBr
 (2) H $^{\oplus}$ /H₂O (2) Alcohol

4. How many set of carbonyl compound and RMg X can produce 3° alcohol.

5. Find out numbers of possible E_1 products from following reaction.

$$\xrightarrow{\text{CH}_3\text{OH}} \xrightarrow{\Delta}$$

6. Identify number of substrate those can give $S_N 1$ and $S_N 2$ reaction both.

7. Examine the ten structures shown below and select those that satisfy each of the following condition.

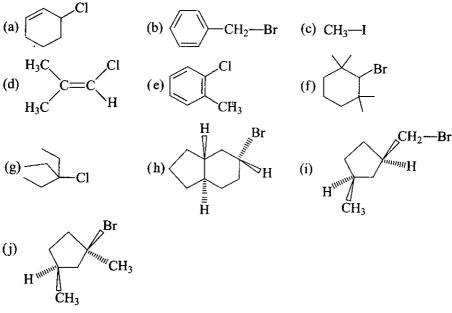
(a)
$$Br$$
 (b) H_3C Cl (c) Br (d) CH_3 —I

(e) Br (f) Cl (g) Cl (h) Cl

(i) Br (j) Cl

- (i) How many compounds give S_N^2 reaction on treatment with NaSH?
- (ii) How many compounds give E_2 reaction on treatment with alcoholic KOH?
- (iii) How many compounds do not react under either of the previous reaction conditions?

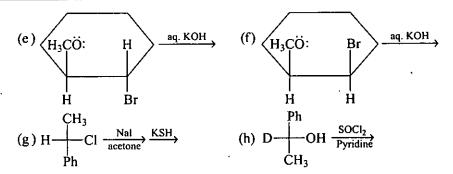
8. Examine the ten structures shown below and select those that satisfy each of the following condition.



- (i) How many compounds give substitution reaction with CH₃SNa?
- (ii) How many compounds give elimination reaction with NaCN?
- (iii) How many compounds do not react with NaOH?
- 9. How many substrates will show rearrangement during S_N^1 reaction?

$$\begin{array}{c} \begin{array}{c} \begin{array}{c} \\ \\ \\ \end{array} \end{array} \begin{array}{c} \\ \\ \\ \end{array} \begin{array}{c} \\ \\ \end{array} \begin{array}{c} \\ \\ \end{array} \begin{array}{c} \\ \\ \end{array} \begin{array}{c} \\ \\ \\ \end{array} \begin{array}{c} \\ \\ \end{array} \begin{array}{$$

10. Find out number of reactions those proceed with retention of configuration.



◊▮

Level-1

ANSWERS



Exercise-1: Only One Correct Answer

1. (a)	2. (a)	3 . (a)	4 . (b)	5 . (a)	6. (d)	7 . (d)	8. (d)	9. (c)	10 . (b)		
11. (c)	12. (b)	13. (c)	14. (c)	15. (b)	16. (b)	17. (d)	18. (a)	19. (d)	20. (b)		
21. (b)	22. (a)	23. (c)	24. (b)	25 . (d)	26. (b)	27. (a)	28. (c)	29. (a)	30 . (b)		
31. (a)	32. (c)	33. (c)	34. (d)	35. (d)	36 . (a)	37 . (d)	38 . (b)	39. (c)	40 (c)		
41. (c)	42 . (c)	43. (d)	44. (a)	45 . (c)	46. (a)	47. (c)	48 . (c)		•		
Level-2											
1. (d)	2. (a)	3. (a)	4. (c)	5 . (a)	6 . (b)	7. (c)	8. (a)	9. (b)	19. (c)		
11. (d)	12. (b)	13. (a)	14. (c)	15. (b)	16. (c)	17. (a)	18. (c)	19. (d)	20 . (b)		
21 . (c)	22. (d)	23. (b)	24. (a)	25. (c)	26. (b)	27. (c)	28. (a)	29. (b)	30 . (c)		
31. (d)	32 . (b)	33. (c)	34 . (b)	35 . (c)	36 . (b)	37. (a)	38. (c)	39. (d)	40 (b)		
41 . (c)	42. (a)	43 . (c)	44. (b)	45. (a)	46. (a)	47. (b)	48. (b)	49. (c)	50 . (c)		
51. (b)	52. (d)	53. (a)	54. (c)	55. (a)	56. (c)	57. (b)	58. (d)	59. (a)	60. (c)		
61 . (b)	62. (c)	63. (a)	64. (b)	65 . (d)	66 . (a)	67. (c)	68 . (b)	69 . (d)	76 . (b)		
71. (c)	72 . (d)	73 . (b)	74. (c)	75. (b)	76 . (c)	77 . (b)	78. (b)	79 . (d)	89. (c)		
81 . (b)	82. (a)	83. (d)	84. (b)	85 . (d)	86 . (c)	87. (a)	88 . (a)	89. (c)	90. (c)		
91 . (a)	92. (b)	93. (b)	94. (a)	9 5. (b)		97 . (c)	98. (a)		100 . (b)		
101. (a)									110. (c)		
									120. (b)		
									130. (a)		
131. (a)	132. (c)	133. (b)	134. (c)	135. (b)	136. (d)	137. (d)	138. (b)	139. (d)	140. (c)		
141. (c)	142. (b)	143. (a)	144. (c)	145. (a)	146. (c)	147. (d)	148, (c)	14A (p)	150. (b)		
						72\' (q)	728' (9)	73a. (c)	160 . (b)		
161 . (c)	162. (b)	163. (a)	164. (d)	165. (b)	.						
					•						

Exercise-2: More Than One Correct Answers

_											
}	(a, b, c)	2	(b, d)	3	(a, b, c)	٦.	(a, b, d)	- '3	(b, c)		(b, c, d)
,	√ (b, c)	8	(a, c)	9.	(a, b, c, d)	19.	(a, b, d)		(a, b, d)		(b, c)
1:	3. (a, b)	14.	(a, b, d)	15.	(b, c)	19	(a, c, d)	<u>.</u> "	(a, c, d)		(a, c, d)
	(b, c, d)										
	(a, b)										
31	(a, b, d)	32.	(a, b, c)	33.	(b, c, d)	34.	(a, c)	\$4.	(a, b)	1,3,	(a, b, c, d)
37	'- (a, c)	38.	(b, d)	39.	(b, c)	49.	(a, b)	4.5	(a, b, c)	44	(a, b, c)
43	3. (a, b, c)	44.	(a, b, c)	45	(a, b, c, d)	A 6	(a, b, d)	27,	(a, b, c)	43.	(a, b, d)
49	(b, c, d).	<u>50.</u>	(a,,b,,c)								

Exercise-3 : Linked Comprehension Type

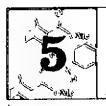
1. (b)	2. (d)	3. (a)	4. (d)	ხ. (c)	b	(b)	7	(a)	ξ	(c)	Э	(a)	10	(b)
11. (c)	12. (d)	13. (b)	14. (c)	15 (a)	in	(a)	17	(c)	18.	(b)	10	(a)	20	(d),
				25. (b)										

Exercise-4: Matrix Match Type

	1. (a) $\rightarrow P$, Q , R ;	(b) $\rightarrow P, R$;	(c) $\rightarrow P$, S;	$(d) \rightarrow P, R$	-1
	2. (a) → R;	(b) → S;	(c) \rightarrow Q ;	$(d) \rightarrow P$	
į	3. (a) $\rightarrow Q, R$;	(b) $\rightarrow Q, R$;	(c) → <i>P</i> ;	(d) → S	
	4. (a) → P, S;	(b) $\rightarrow P$, S;	(c) $\rightarrow Q, R$;	(d) $\rightarrow P$, S	;
	5. (a) $\rightarrow P$, R;	(b) $\rightarrow Q$, S;	(c) → R;	(d) $\rightarrow Q$, S	ĺ
	6. (a) → R, S;	(b) $\rightarrow R$, S;	$(c) \rightarrow P, R;$	$(d) \rightarrow P, Q$	į
1	7. (a) $\rightarrow Q, R$;	(b) $\rightarrow P$, S;	(c) $\rightarrow Q, R$;	(d) $\rightarrow P$, S	•
i	8 . (a) → Q;	(b) $\rightarrow P$;	(c) → S;	(d) → R	'
	9. (a) $\rightarrow P$, S;	(b) $\rightarrow Q, R$;	(c) $\rightarrow Q, R$;	(d) $\rightarrow P, R$	
ł	10. (a) \to Q;	(b) $\rightarrow P$;	(c) → S;	(d) $\rightarrow R$	
Į	11. (a) \rightarrow S;	(b) → Q. S;	(c) $\rightarrow R$, S;	$(d) \rightarrow P$	
ı	12. (a) $\rightarrow R$, S;	(b) $\rightarrow R$, S;	(c) $\rightarrow P$;	$(d) \rightarrow Q, R$	
	13. (a) $\rightarrow P$, Q ;	$\underline{(b)} \rightarrow Q_{i}R;$	(c) → S;	$(d) \rightarrow P. S$	

Exercise-5: Integer Answer Type Problems

ı	1 (7) 2 (4) 3 (4) 4 (5)		
I	± (3)	5. (4) 5. (6) 7 (i) 5, C, D, E, F, H	
ŀ		8. (i) 5, A, B, C, H, I (ii) 2, G, J (iii) 3, D, E, F	
	9. (6) 10. 4, A, C, E, G		



Alcohol and Ethers



ONLY ONE CORRECT ANSWER EXERCISE:



- 1. An alkene obtained by the dehydration of an alcohol (A), on ozonolysis gives two molecules of acetaldehyde for every molecule of alkene. The alcohol (A) is:
 - (a) CH₃CH₂CH₂OH

(b) CH₃CH₂OH

(c) CH₃CH=CHCH₂OH

(d) CH₃CH₂CHCH₃

2. $R \longrightarrow COOH \rightarrow R \longrightarrow CH_2OH$. This mode of reduction of an acid to alcohol can be effected by:

- (a) Zn/HCl
- (b) Na alcohol
- (c) Aluminium isopropoxide and isopropyl alcohol
- (d) LiAlH₄

3. Wood Destructive distillation X + Y + Z; products X, Y, Z are:

- (a) CH₃OH, CH₃COOH, CH₃COCH₃ (b) CH₃COOH, HCOOH, CH₃OH
- (c) CH₃OH, CH₃COOH, CH₃CHO (d) CH₃COOH, CH₃COCH₃, CH₃CHO
- 4. Which of the following reaction(s) will yield propane-2-ol?

(a)
$$CH_2 = CH - CH_3 + H_2O \xrightarrow{H^+}$$
 (b) $CH_3 - CHO \xrightarrow{(i) CH_3Mgl}$

(c)
$$CH_2O \xrightarrow{(i) C_2H_5Mgi}$$

(d)
$$CH_2 = CH - CH_3 \frac{\text{Neutral KMnO}_4}{\text{Neutral KMnO}_4}$$

5.
$$Z \xrightarrow{\text{PCl}_4} X \xrightarrow{\text{Alc. KOH}} Y \xrightarrow{\text{1 Conc. H}_2\text{SO}_4} Z$$
; Z is:

(a)
$$CH_3 - CH_2 - CH_2 - OH$$

(a)
$$CH_3 - CH_2 - CH_2 - OH$$
 (b) $H_3C - CH - CH_3$ OH

(c)
$$(C_2H_5)_3C$$
—OH

(d)
$$CH_3 - CH = CH_2$$

- 6. 1-propanol and 2-propanol can be best distinguished by:
 - (a) oxidation with alkaline KMnO₄ followed by reaction with Fehling's solution
 - (b) oxidation with acidic dichromate followed by reaction with Fehling's solution
 - (c) oxidation by heating with copper followed by reaction with Fehling's solution
 - (d) oxidation with conc. H₂SO₄ followed by reaction with Fehling's solution

- 7. On heating glycerol with KHSO₄/ Δ , a compound is obtained, which has a bad odour. The compound is:
 - (a) Acrolein

(b) Formic acid

(c) Allyl alcohol

- (d) Methyl isocyanide
- 8. A compound X with molecular formula C_3H_8O can be oxidized to a compound Y with the molecular formula $C_3H_6O_2$. X is most likely to be a:
 - (a) primary alcohol

(b) secondary alcohol

(c) aldehyde

- (d) ketone
- 9. Identify (Z) in the following series,

Ethanol
$$\xrightarrow{PBr_3}$$
 $(X) \xrightarrow{Alc./KOH} (Y) \xrightarrow{(i) H_2SO_4/Room \text{ temp.}} (Z)$

- (a) $CH_2 = CH_2$ (b) $CH_3 CH_2 OH$ (c) $CH_3 CH_2 O CH_2 CH_3$ (d) $CH_3 CH_2 SO_3H$
- 10. Which one of the following is not the characteristic of alcohols?
 - (a) Their boiling points rise fairly uniformly with a rise in molecular weight
 - (b) Lower members have a pleasant smell but burning taste and the higher ones are odorless and tasteless
 - (c) These are lighter than water
 - (d) Lower members are insoluble in water and organic solvents but the solubility goes on increasing with the rise of molecular weight
- Dil. H_2SO_4/Hg^{2+} 1 — Methylcyclohexanol. Here A is:







- (d) (a) or (b)
- 12. Predict the nature of P in the following hydration reaction of alkenes.

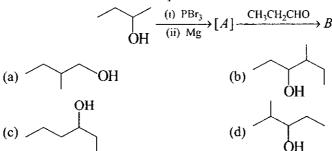
$$Ph \xrightarrow{\text{Dil H}_2 \text{SO}_{4} \text{Hg}^{2+}} P$$

(a) OH

- 13. 2-Phenylbutan-2-ol can be prepared by which of the following combinations?

 - (a) $C_6H_5COCH_3 + C_2H_5MgBr$ (b) $C_2H_5COCH_3 + C_6H_5MgBr$
 - (c) $C_6H_5COC_2H_5 + CH_3MgBr$
- (d) All of these
- 14. Predict the nature of reducing agent in the following reaction.

- (a) LiAlH₄
- (b) NaBH₄
- (c) H_2/Pt
- (d) Both (a) and (c)
- 15. The correct structure for compound B will be :



- 16. An industrial method for the preparation of methanol is:
 - (a) by reacting CH₄ with steam at 900°C with a nickel catalyst
 - (b) by reduction of HCHO with LiAlH₄
 - (c) by catalytic reduction of CO in presence of ZnO Cr₂O₃
 - (d) by reaction of HCHO with NaOH(aq.)
- 17. Absolute alcohol cannot be obtained by simple fractional distillation because
 - (a) pure C₂H₅OH is unstable
 - (b) C₂H₅OH forms hydrogen bonding with water
 - (c) boiling point of C₂H₅OH is very close to that of water
 - (d) constant boiling azeotropic mixture is formed with water
- 18. The product when glycerol reacts with PCl₅ is:
 - (a) 1, 2, 3 trichloropropane
- (b) glycero monochlorohydrin
- (c) glycero dichlorohydrin
- (d) all of these
- 19. Glycerol $\xrightarrow{\text{KHSO}_4} A \xrightarrow{\text{LiAlH}_4} B$.

A and B are:

- (a) acrolein, allyl alcohol
- (b) glyceryl sulphate, acrylic acid
- (c) allyl alcohol, acrolein
- (d) only acrolein (B is not formed)

- (a) (i) Cu, 300°C
- (b) (i) CrO₃,
- (c) (i) KMnO₄
- (d) (i) $Na_2Cr_2O_7 + H_2SO_4$
- (ii) CH₃CH₂MgBr, H₃O⁺
- (ii) CH₃CH₂MgBr, H₃O⁺
- (ii) CH₃CH₂MgBr, H₃O⁺
- (ii) CH₃CH₂MgBr, H₃O⁺

22. The conversion

$$\begin{matrix} \text{O} & \text{OH} \\ \parallel & \parallel \\ \text{H}_3\text{C}--\text{C}+-\text{CH}_2\text{CH}_2\text{CO}_2\text{CH}_3 \rightarrow \text{H}_3\text{C}--\text{CH}--\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \end{matrix}$$

can be effected using:

- (a) LiAlH₄ and then H⁺
- (c) H₂/Pt carbon

- (b) NaBH₄ and then H⁺
- (d) All

23.
$$H_3C$$
 O $CH_2 \xrightarrow{LiAiH_4} A$, A is:

- (a) CH₃CHCH₂OH | CH₃
- CH₃ (c) CH₃C—OH

 CH_3

24. $\longrightarrow A, A \text{ is } :$

(d) no reaction

- 25. Which of the following can be obtained from a mixture of ethanol and concentrated sulphuric acid, if the composition of the mixture and the reaction conditions are suitably adjusted?
 - (a) C_2H_4

(b) $(C_2H_5)_2SO_4$

(c) CH₃CH₂OCH₂CH₃

- (d) CH₃CH₂HSO₄
- 26. An aromatic amine (X) was treated with alcoholic potash and another compound (Y), a foul smelling gas was formed with formula C₆H₅NC. (Y) was formed by reacting a compound (Z) with Cl₂ in the presence of slaked lime. The compound (Z) is:
 - (a) $C_6H_5NH_2$
- (b) C₂H₅OH
- (c) CH₃OCH₃
- (d) CHCl₃
- 27. An alcohol (A) on dehydration gives (B), which on ozonolysis gives acetone and formaldehyde. (B) decolourises alkaline KMnO₄ solution but (A) does not. (A) and (B) are respectively:
 - (a) CH₂CH₂CH₂CH₂OH and CH₂CH₂CH=CH₂
 - (b) CH_2CH_2 —CH— CH_2 and CH_2 —CH=CH— CH_2 OH
 - (c) $(CH_3)_3C$ —OH and $(CH_3)_2C$ = CH_2
 - (d) $(CH_3)_3CHCH_2$ —OH and $(CH_3)_2C$ = CH_2
- 28. Absolute alcohol can be obtained from rectified spirit by:
 - (a) fractional distillation
- (b) azeotropic distillation

(c) vacuum distillation

- (d) steam distillation
- 29. If phenyl magnesium bromide and acetaldehyde are the reactants, the product formed after hydrolysis would be:
 - (a) benzyl alcohol

(b) 1-Phenylethanol

(c) 2-Phenylethanol

- (d) Acetone
- 30. Which set of the following reagents (A to D) would you select to convert $C_6H_5COCH_3$ (acetophenone) to the following alcohol?

- (a) CH₃CH₂CH₂MgBr and hydrolysis
- (b) $CH_3CH(Br)CH_3 \cdot AlCl_3$
- (c) (CH₃)₂CHMgBr and acid hydrolysis
- (d) CH₃CHCHCH₃, Zn
- 31. $C_7H_{14}O(X) \xrightarrow{H^+} C_7H_{12}(Y) \xrightarrow{1.B_2H_6} C_7H_{14}O(Z) \cdot (Y)$ (An isomer of X)

$$\begin{array}{c}
1.O_3 \\
\hline
2. Zn/H_2O
\end{array}$$

ÓН

(d) Me₂CHCHCHMe₂ | OH

33. Which of the following reactions is possible?

(c) Me₂CHCOCHMe₂

- (a) $C_6H_5OH + HBr \longrightarrow C_6H_5Br + H_2O$
- (b) $(CH_3)_3CCl + NaOCH_3 \longrightarrow (CH_3)_3COCH_3 + NaCl$

(c)
$$+ CH_3ONa \xrightarrow{CH_3OH} OMe$$
(d) $C_6H_5MgBr \xrightarrow{C_6H_5CH_2C(CH_3)_2} OH$

34.
$$H_3C$$
— CH_3 — $CH_$

- (a) BH_3/THF , H_2O_2/OH^-
- (b) H₃O⁺
- (c) Hg(OAc)₂/NaBH₄, NaOH
- (d) All of these

35.
$$H_2C = CH - C \xrightarrow{Cl} \xrightarrow{Cl_2 + H_2O} A$$
, A is:

36.
$$CH_3CH = CH_2 \xrightarrow{NaBD_4} Product X, X is :$$

(d) none is correct

37. Identify end products A, B and C of the following:

$$\text{CH}_{3}\text{CH} = \text{CH}_{2} \xrightarrow{\text{(i)} \ \text{D}^{+}} A; \text{CH}_{3}\text{CH} = \text{CH}_{2} \xrightarrow{\text{(i)} \ \text{H}^{+}} B; \text{CH}_{3}\text{CH} = \text{CH}_{2} \xrightarrow{\text{(i)} \ \text{D}^{+}} C$$

- (a) CH₃CHCH₃ in all cases
- (b) CH₃CH(OH)CH₂D,CH₃CH(OD)CH₃,CH₃CH(OD)CH₂D
- (c) CH₃CHCH₃ in all cases
- (d) CH₃CHCH₃D in all cases OD

38.
$$RCH = C_1 I_2 \xrightarrow{BH_3 \cdot THF} A \xrightarrow{H_2O_2/OH} B$$

In this sequence of reaction A, B, C and D are respectively:

(a) (RCH₂CH₂)₃B, RCH₂CH₂OH, RCH₂CH₃, HI

(c)
$$(RCH_2CH_3)_3B$$
, RCH — CH_2CH_3 , RCH_2CH_3 , HI
OH

(d) none of the above

39.
$$H_3C$$
— C — CH = CH_2 \longrightarrow H_3C — C — CH — CH_3 , This change can be CH_3 $CH_$

done by:

- (a) acid catalysed hydration(b) oxymercuration-demercuration(c) hydroboration-oxidation(d) any method mentioned above

40. CH₃CHCH₃
$$\xrightarrow{\text{alc /KOH}} A \xrightarrow{\text{HBr/peroxide}} B \xrightarrow{\text{CH}_3\text{ONa}} C$$
Br

In the above reaction sequence, the final product is

(a) diethyl ether

(b) 1-methoxypropane

(c) isopropyl alcohol

- (d) propylene glycol
- **41.** Sodium tertiary butoxide forms ether only with:

(c)
$$H_3C$$
— CH — CH_3

Sodium tertiary butoxide forms ether only with : (a)
$$CH_3 - CH_2 - Br$$
 (b) $CH_3 - X$ (c) $H_3C - CH - CH_3$ (d) $H_3C - CH - CH_3$

42. In the given reaction

$$H_3C$$
 $C = CH - CH_3 \xrightarrow{\text{(i) Hg(OAc)}_2/CH_3OH} [X],$
 H_3C

[X] will be:

OMe OMe OMe (a)
$$H_3C - CH_2 - CH_3$$
 (b) $H_3C - CH_3 - CH_3$ CH_3

(c)
$$H_3C-OH-CH_2-CH_3$$
 (d) $H_3C-OH-CH_2-CH_3$ CH_3

43.
$$H_{3}C$$
 C CH_{2} CH_{3} CH

- (X) and (Y) are respectively:
- (a) LiAlH₄ and NaBH₄
- (c) LiAlH₄ and LiAlH₄/AlCl₃
- 44. \longleftrightarrow + HI \longrightarrow Product,
- (b) LiAlH₄/AlCl₃ and LiAlH₄
- (d) H_2/Ni and H_2/Pt

Product is:

45.
$$(C)$$

C is:

- (b) CH₂-CH₂
 OH
- (d) none of these
- 46. Which of the following reaction is possible?
 - (a) $C_6H_5OH + HBr \longrightarrow C_6H_5Br + H_2O$
 - (b) $(CH_3)_3CCl + NaOCH_3 \longrightarrow (CH_3)_3COCH_3 + NaCl$

$$Cl$$
 OMe $Cl + CH_3ONa \xrightarrow{CH_3OH} Cl$

(d)
$$V \leftarrow C_6H_5MgBr \xrightarrow{H_3O^+} C_6H_5CH_2C(CH_3)_2$$

OH

47.
$$H_2C$$
 $CH_2 \xrightarrow{(i) CH_3MgCl} X$. The product obtained in this reaction is :

- (a) CH₃CH₂OH
- (b) (CH₃)₂CHOH
- (c) CH₃CH₂CH₂OH
- (d) $HO CH_2 CH_2 CH_2 CH_2 OH$
- **48.** What is 'Z' in the following sequence of reactions?

$$Z \xrightarrow{\quad \text{PCl}_3 \quad} X \xrightarrow{\quad \text{alc. KOH} \quad} Y \xrightarrow{\quad \text{(i) Conc. H}_2 \text{SO}_4 \quad} Z$$

(a) CH₃CH₂CH₂OH

(b) CH₃CHOHCH₂

- (c) (CH₃CH₂)₂CHOH
- (d) $CH_3CH = CH_2$

49.
$$H_3C$$
— CH — $CH_2 \xrightarrow{\text{(i) } CH_3 = C} Product ?$

Product is:

(a)
$$H_3C$$
— CH — CH_2 — CH = CH_2 — CH_3
 OMe

(b)
$$H_3C$$
— CH — CH_2 — C $\equiv C$ — CH_3

OMe

(c)
$$H_3C$$
— CH — CH_2 — C = C — CH_3

OH

(d)
$$H_3C$$
— CH — CH — $C=C$ — CH_3

50. In the reaction

$$2C_2H_5OH \xrightarrow{Al_2O_3} (C_2H_5)_2O + H_2O$$

alumina acts mainly as:

- (a) an absorbent of water
- (b) a provider of hot solid surface
- (c) a Lewis acid to coordinate (C₂H₅)₂O formed
- (d) a Lewis acid catalyst to increase the leaving group ability of the OH group by coordination at oxygen

LEVEL-2

1.
$$A \leftarrow \frac{PhCH_2-I}{CF_3CH_2OH}$$
 $\longrightarrow PhCH_2-I$ DMSO

A and B are respectively:

(a)
$$A - \bigcirc$$

O—CH₂—Ph

OH

CH₂Ph

OCH₂Ph

OCH₂Ph

OCH₂Ph

OCH₂Ph (c)
$$A - B -$$

(d)
$$A = B - CH_2Ph$$

Which of the following is the best set of reagents to perform the above conversion?

(a) ThO₂, Δ

(b) H_3PO_4 , Δ

(c) Conc. H₂SO₄; Δ

(d) Al_2O_3 , Δ

3.
$$\xrightarrow{H^{\bigoplus}/H_2O} Product$$

The main product is:

(a)
$$CH_{2}OH$$
 (b) CH_{3} (c) $CH_{3}OH$ (d) $CH_{3}OH$ (d) $CH_{3}OH$ (e) $CH_{3}OH$ (for $CH_{3}OH$)) $CH_{3}OH$ (for $CH_{3}OH$)) $CH_{3}OH$ (for $CH_{3}OH$ (for $CH_{3}OH$)) $CH_{3}O$

The final product is:

5.
$$2Ph$$
— C — CH_3 $\xrightarrow{Mg-Hg}$ $\xrightarrow{Dil. H_2 SO_4}$ $\xrightarrow{Product}$

The main product is:

The final product A is:

(a)
$$Me_3C$$
 (b) Me_3C Cl Me_3C Cl Me_3C Cl Cl Cl $Br_2 + H_2O$ OCH_3 OCH_3

The product is:

7.

8. Which of the following sets of reagents would accomplish the following conversion?

- (a) $CH_3CH_2CH_2MgBr$; H^{\oplus}/H_2O , PCC, CH_2Cl_2
- (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgBr}$; H^{\oplus} / H_2O ; $\text{H}_2\text{SO}_4, \Delta; \text{PCC}, \text{CH}_2\text{Cl}_2$
- (c) $Ph_3P = CHCH_2CH_3$; B_2H_6 , H_2O_2 , OH
- (d) $Ph_3P = CHCH_2CH_3$; H_2SO_4 , H_2O
- An organic compound A (Molecular formula C₆H₁₂O₄) on treatment with Na metal liberates H₂ gas and on treatment with HIO₄ gives 2 moles of CH₃CHO, HCOOH (1 mole) and CO₂ (1 mole). Find out structure of A.

10. An organic compound A (Molecular formula C₆H₁₂O) does not change the colour of acidic dichromate solution. Compound A on treatment with H₂SO₄ produces alkene, which on oxidative ozonolysis gives a molecule (C₆H₁₀O₃) which gives positive iodoform test. Find out structure of 'A'.

(a)
$$OCH_3$$
 (b) OH (c) OH (d) OH CH_3

11.
$$\frac{\text{Br}}{\text{H}_{1}} C \xrightarrow{\text{CH}_{3}} H \xrightarrow{\text{Conc. HBr}} \text{Product}$$

$$H_{3}C \xrightarrow{\text{OH}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{3}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{3}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{3}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{3}} C \xrightarrow{\text{N}_{1}} C \xrightarrow{\text{N}_{2}} C \xrightarrow{\text{N}_{3}} C \xrightarrow{\text{N}_{3}}$$

$$\begin{array}{c} \text{CH}_3\text{CH}_2 \\ \text{H}_{1000000} \\ \text{OH} \end{array} \xrightarrow{\text{Conc. HBt}} \text{Product}$$

—OH group is substituted by —Br. The slowest step is dehydration. Which of the following is correct comparison of rate constants k_1 and k_2 ?

(a)
$$k_1 = k_2$$

(b)
$$k_1 > k_2$$

(c)
$$k_1 < k_2$$

(d) cannot be predicted

12.
$$C_5H_{12}O_2 \xrightarrow{K_2Cr_2O_7} C_5H_8O_3 \xrightarrow{CH_3OH, H^{\bigoplus}} C_6H_{10}O_3 \xrightarrow{LiAlH_4} A + CH_3OH$$

$$\downarrow H^{\bigoplus} A \qquad \qquad \downarrow A$$

$$CH_3$$

The molecule A in the sequence reaction is:

(a) OH (b) OH OH

OH OH

$$OH$$
 OH

 OH OH

The products A and B are respectively:



(a)
$$A = H_2N$$
 $B = OH$
 $B = OH$

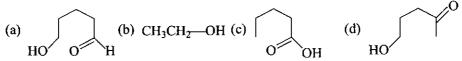
14.
$$H_3C$$
 H POCl₃ Pyridine A

H OH POCl₃ Pyridine B
 A

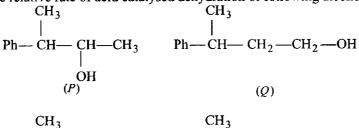
Products A and B are respectively:

(a)
$$A = \langle \rangle$$
 ; $B = \langle \rangle$ (b) $A = B = \langle \rangle$

15.
$$\underbrace{H^{\oplus}/H_2O}_{OCH_3}$$



16. The relative rate of acid catalysed dehydration of following alcohols would be:



$$\begin{array}{ccccc} \text{CH}_3 & \text{CH}_3 \\ | & & | \\ \text{Ph--C--CH}_2\text{CH}_3 & | \\ | & & | \\ \text{OH} & & \text{CH}_3 \\ & & & | \\ & & \text{CH}_3 \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & & | \\ & & | \\ & & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & & | \\ & | \\ & & | \\ & | \\ & | \\ & | \\ & | \\ & | \\ & | \\ & | \\ & | \\ & | \\ & |$$

(a)
$$R > P > S > Q$$
 (b) $R > S > P > Q$ (c) $P > R > S > Q$ (d) $R > S > Q > P$

- 17. Which of the following alcohols will show positive iodoform test?

 - (c) ICH₂—CH—CH₂CH₃
- (d) None of these

18. In the given reaction,

$$(A) \xrightarrow{\text{CH}_3} \xrightarrow{\text{B}_2\text{H}_6} \xrightarrow{\text{TsCl}} \xrightarrow{\text{Me}_3\text{CO}^{\Theta}\text{K}^{\oplus}} (B)$$

The product B is:

(a) Identical to B

- (b) Chain isomer of A
- (c) A positional isomer of 'A'
- (d) Reduced product of A

19.
$$O \xrightarrow{SOCl_2} \xrightarrow{Pyridine, \Delta} \xrightarrow{Mg} \xrightarrow{O} \xrightarrow{H^{\oplus}} Product$$

The final product is:

(a) OH

(p) OH

(c) OH

(d) OH

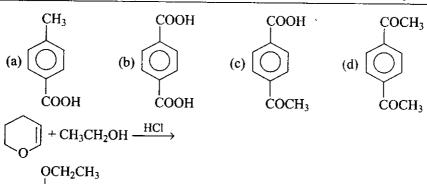
26.

НО

-OH

(a)
$$(b)$$
 (b) (c) (d) (d)

27.



28. Which of the following reacts fastest with HBr?

$$(a) \begin{picture}(200) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0){$$

29. The order of reactivity of following alcohols toward HCl is:

(a)
$$1 > 2 > 3 > 4$$

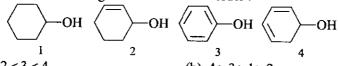
(b) $1 > 3 > 4$
(c) $4 > 3 > 2 > 1$
(d) $4 > 3 > 1 > 2$

30. The order of solubility of

in water is:

(a)
$$I > II > III$$
 (b) $I < II < III$ (c) $II > III > I$ (d) $II > I > III$

31. Dehydration of following alcohols will be in order:



(a) 1 < 2 < 3 < 4

(b)
$$4 > 3 > 1 > 2$$

(c) 4 > 2 > 1 > 3

(d) 1>3>4>2

32. Which of the following reactions proceeds with retention of configuration?

(a)
$$H \xrightarrow{\text{Na}} OH \xrightarrow{\text{Na}} \xrightarrow{\text{CH}_3\text{Br}} \text{(b) } H \xrightarrow{\text{Me}} OH \xrightarrow{\text{TsCl}} \xrightarrow{\text{CH}_3\text{ONa}} \text{CH}_3\text{ONa}$$
(c) $H \xrightarrow{\text{PCl}_5} \xrightarrow{\text{CH}_3\text{ONa}} \text{(d) } H \xrightarrow{\text{OH}} OH \xrightarrow{\text{SOCl}_2} \xrightarrow{\text{KCN}} \text{CH}_3$

33. Find out correct product of reaction:

$$(a) \qquad (b) \qquad (Excess)$$

$$(a) \qquad (b) \qquad (Br \qquad (Excess)$$

34. Cl—Br Mg/ether HCHO HCHO
$$(a) \qquad (b) \qquad (c) \qquad (b) \qquad (c) \qquad (c)$$

36.
$$OH \xrightarrow{MnO_2} Product$$

The main product is:

HO

41.

HO

 $OH \xrightarrow{MnO_2} \xrightarrow{CH_3CH_2OK} Major Product :$

(a)
$$OH$$
 (b) OH (c) OH (d) OH

42.
$$OH \xrightarrow{1. \text{ Pb } (OAc)_4} (X)$$

$$OH \xrightarrow{2. \text{ OH/H}_2O}$$

(X) will be:

The above reaction is known as:

- (a) Clemmensen reduction
- (b) Birch reduction
- (c) MPV reaction

43.

- (d) Wolff-Kishner reaction
- 44. In the following reaction

$$\xrightarrow{\text{H}_3 \overset{\oplus}{\text{O}}} \text{Product}$$

The major product is:

The major product obtained in this reaction is:

⇒ Find out major products of following reactions. (Question No. 46-50)

46. Ph
$$CH_3$$
 CH_3 Ph $Conc.H_2SO_4$ OH OH

(c) CH₃-

(d) None of these

49. Ph
$$H$$
 H H

(a) Ph O (b) Ph (c) Ph O (d) Ph
$$H_2SO_4$$

(a) CH_3

(b) CH_3

(c) Ph O (d) Ph H_2SO_4

(d) CH_3

(e) CH_3

(f) CH_3

(g) CH_3

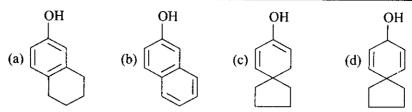
(h) CH_3

- ⇒ Find out major products of following reactions. (Question No. 51-55)
- 51. $OH \xrightarrow{Conc. H_3PO_4}$ (a) $OH \xrightarrow{Conc. H_3PO_4}$ (b) $OH \xrightarrow{Conc. H_3PO_4}$ (c) $OH \xrightarrow{Conc. H_3PO_4}$

- 53. CH_2 —OH

 HO— CH_2 CH_2 —OH

 (a) (b) (c) (d)
- 54. $OH \xrightarrow{Conc. H_2SO_4}$ (a) (b) (c) (d)
- 55. $\frac{\text{Conc. H}_2\text{SO}_4}{\Delta}$



56. When ethylene glycol is heated with oxalic acid in the presence of conc. H₂SO₄, the product formed is:



- 57. An organic compound having molecular formula C₃H₆O does not react with 2, 4-dinitrophenyl hydrazine and does not react with Na metal. The compound is expected to be:
 - (a) CH₃CH₂CHO
- (c) $CH_2 = CH CH_2 OH$
- (b) CH_3COCH_3 (d) $CH_2 = CH O CH_3$
- 58. Which of the following statements is correct?
 - (a) Phenol is less acidic than ethanol
 - (b) Phenol is more acidic than ethanol
 - (c) Phenol is more acidic than p-nitrophenol
 - (d) Phenol is more acidic than acetic acid
- 59. The vapours of an alcohol (X) are passed over Cu heated at 300°C whereby an alkene is formed as product. The alcohol (X) is expected to be:

(a)
$$OH$$
 (b) OH (c) Ph OH (d) OH

The major product formed in the reaction is:

(a)
$$(b)$$
 (c) (d) (d)

is prepared best by the reaction:

(a)
$$(CH_3)_3C$$
—Br + $(CH_3)_3COK$ ———

(b)
$$(CH_3)_3C - OH \xrightarrow{H_2SO_4} 140^{\circ}C$$

(c)
$$(CH_3)_3C \longrightarrow OH \xrightarrow{Al_2O_3} 240^{\circ}C$$

(d)
$$(CH_3)_2C = CH_2 \xrightarrow{Conc. H_2SO_4} \xrightarrow{(CH_3)_3COH}$$

- 62. When 2-chloroethanol is warmed slightly with dilute NaOH, the major product formed is:
 - (a) $CI CH_2 CH_2 O CH_2 CH_2 CH_2$ (b) $HO CH_2 CH_2 CH_2 CH_2 OH$ (c) $HO CH_2 CH_2 OH$

 - (d)
- OH) on heating with conc. H₂SO₄ gives mainly: 63. Ethylene glycol (HO



- 64. Which of the following reactions would give the best yield of t-butyl methyl ether?
 - (a) $(CH_3)_3C \longrightarrow OH \xrightarrow{H_2SO_4}$ (b) $(CH_3)_3C \longrightarrow Br + CH_3OH \longrightarrow$
 - (c) $(CH_3)_3C$ —Br + $CH_3\overset{\ominus}{O}Na^{\oplus}$ \rightarrow (d) $(CH_3)_3C$ — $\overset{\ominus}{O}K$ + CH_3Br \rightarrow
- 65. Consider the following reactions

$$\begin{array}{c|c} \operatorname{CH_2} & \operatorname{CH_2} & \xrightarrow{\operatorname{NaOH}} & A & \xrightarrow{\operatorname{NaH}} & B & ; & B + \operatorname{CH_2} & \operatorname{CH_2} & \longrightarrow C \\ & | & | & | & | & | & | \\ \operatorname{Br} & \operatorname{Br} & \operatorname{Br} & \operatorname{Br} & B \end{array}$$

The product (C) is:

(a) OH OH.

- `o′ (b) Br
- (c) HO HO'
- \sim OH $\xrightarrow{\text{H}_2\text{SO}_4}$ 66. In the reaction HO

The major product formed is:

(a) HO CH₂

67. The major product formed in the reaction is:

$$OH \qquad OH \qquad OH \qquad OH \qquad OO$$
(a)
$$O \qquad OH \qquad OO$$

$$OH \qquad OO \qquad OO$$

$$OO \qquad OO \qquad OO$$

$$OO \qquad OO \qquad OO$$

68. Consider the following reaction,

$$H_2C = CH - CH_2CH_2 - OH \xrightarrow{Br_2/CCl_4} A \xrightarrow{Dil. KOH} B$$

The product B is:

(a)
$$Br$$
OH
(b) HO
OH
(c) O
Br
(d) O

69. Find out correct product of following reaction:

$$CH_3CH_2Br \xrightarrow{Ag_2O, dry} \Delta$$
(b) $CH_2 = CH_2$ (c) $\wedge O$ (d) CH_3CH_2OH

70. The major product (X) of the reaction:

$$OH \xrightarrow{H_2SO_4} X'$$
(a) O
(b) O
(d) O

71. In the reaction,

$$H_3C$$
 C
 CH_2
 CH_3OH
 H^{\oplus}
 (X)

The product (X) has the structure:

72. Consider the following sequence of reactions

$$H_2C = CH - COOCH_3 + Br_2 \xrightarrow{CCl_4} A$$

OH

OH

OH

OH

The end product (B) is:

73. In the reaction:

$$Me_3C$$
—O— $CH_2CH_3 + HI$
(1 Mole) $\xrightarrow{\Delta}$

- (a) Me_3C — $OH + CH_3CH_2I$
- (b) $Me_3C-I+CH_3CH_2OH$
- (c) $Me_3C-I+CH_3CH_2I$
- (d) Me_3C — $OH + CH_3CH_2OH$

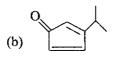
OH

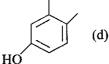
(b) Ph---O---Ph

$$(d) \rightarrow O \leftarrow$$

75.
$$\xrightarrow{H^{\oplus}}$$
 Major product :







76. The product of the reaction is:

$$\begin{array}{c}
O \\
\hline
1. KH \\
2. H_2O
\end{array}$$

(c)

(a)
$$(b)$$
 (c) (c) (d) (d) (d) (d) (d)

77. Which of the following reactions will not result in the formation of anisole?

(a)
$$\langle \bigcirc \rangle$$
 OH + (CH₃)₂SO₄ $\xrightarrow{\text{NaOH}}$ (b) $\langle \bigcirc \rangle$ OH + CH₃I \longrightarrow

(d) (±)-2-butanol

(c)
$$\langle \bigcirc \rangle$$
 —OH + CH₂N₂ — \rangle (d) $\langle \bigcirc \rangle$ —OH + CH₃MgI — \rangle

78. Consider the following sequence of reactions.

HO Pyridine
$$A \xrightarrow{\text{P-TsCl}} A \xrightarrow{\text{AcOK}} B \xrightarrow{\text{KOH}} C$$

Pyridine
$$A \longrightarrow A \longrightarrow B \longrightarrow H_2O, \Delta$$

The major product (C) is:

(a) $A \longrightarrow A \longrightarrow B \longrightarrow H_2O, \Delta$

(b) $A \longrightarrow A \longrightarrow B \longrightarrow H_2O, \Delta$

(c) $A \longrightarrow A \longrightarrow A \longrightarrow A \longrightarrow A$

- (a) B_2H_6/H_2O
- (c) CH₃OH/Na

- (b) LiAlH₄
- (d) P/HI

(c) 🔨

80.
$$O$$
 A HO O H

Reagent A used in this change is:

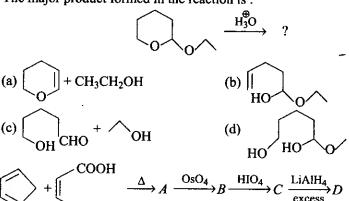
(a) B_2H_6 (c) Sn/HCl

- (b) LiAlH₄
- (d) NaBH₄

- -(d) No reaction

82. The major product formed in the reaction is:

COOH



85. Find out the product when compound reacts with $NaBH_4$:

86. COOH
$$K_2Cr_2O_7$$
 X

; This conversion can be carried out by :

- (a) H_2SO_4/Δ , HIO_4
- (b) NaIO₄, H^{\oplus}/Δ
- (c) HIO₄, NaBH₄
- (d) H^{\oplus}/Δ , Zn(Hg HCl)

- 92. Which of the following alcohols will not give iodoform test?
 - (a) Ph

(b) CH₃—CH₂—OH

(c) OH

(d) V

93. OH HB

18OH

- HBr CCl Major product obtained in this reaction is:
- (a) O Pl

(b) OH Ph

(c) OH

COOC₂H₅

(d) Br

- 94. (a) racemic
- $\xrightarrow{\text{LiAlH}_4}$; Products of the reaction is :
- (c) meso

- (b) diastereomers(d) optically pure
- 95. Reduction of R— CH_2OH — $\to RCH_3$ can be carried out by :
 - (a) LiAlH₄ OPh
- (b) H₂—Ni
- (c) Red P + HI
- (d) NaBH₄/AlCl₃

96. OPh

HI (excess); which of the following is major product?

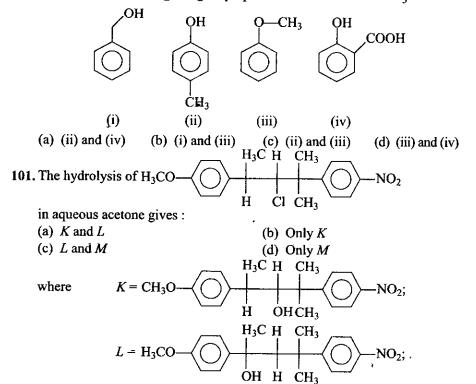
OPh
I
(a)

- (p) OH OH
- (c) ____I
- (d) None of these
- 97. Which of the following ethers will get hydrolysed by H^{\oplus}/H_2O ?
 - (a) (O)-O-(O)
- (b) O-O-
- (c) $\langle \bigcirc \rangle$ -0 $-C \equiv C$ $-CH_3$
- (d) O-C

98. Which of the following alcohols will not react with Cu/Δ ?

99.
$$OH$$
Br $AgNO_3$
 $Agno_4$
 $Agno_4$

100. Which of the following can give purple colour with neutral FeCl₃?



$$M = H_{3}CO \longrightarrow H_{3}CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{2} CH_{2} CH_{2} CH_{3} CH_{3} CH_{3} CH_{2} CH_{2} CH_{3} CH_{3} CH_{3} CH_{2} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{3} CH_{4} CH_{2} CH_{4} CH$$

106.
$$\longrightarrow$$
 + CH₃MgBr $\xrightarrow{H^{\oplus}/\text{H}_2\text{O}} P \xrightarrow{\text{HBr}} Q \xrightarrow{\text{Mg}} R \xrightarrow{\text{HCHO}} S$.

S is:

(a) OH

(b) OH

(c) OH

(d) OH

107. Identify the major product of the following reaction:

(a)
$$Conc. H_2SO_4$$
 Δ (b) $Conc. H_2SO_4$ (d) $Conc. H_2SO_4$

108. Find the correct method for the following conversion:

$$\stackrel{\text{OH}}{\longrightarrow} \stackrel{\text{Br}}{\longrightarrow} \stackrel{\text{OH}}{\longrightarrow}$$

(a) [⊖]OH, HBr

(b) Conc. H_2SO_4 , Δ

(c) H[⊕], HBr

(d) None of these

109. Which combination of reagents will bring about the following conversion?

- (a) MeMgBr/H $^{\oplus}$, H₂SO₄/ Δ , HBr/H₂O₂
- (b) MeMgBr/H $^{\oplus}$, H₂SO₄/ Δ , HBr
- (c) MeMgBr/H[⊕], HBr/CCl₄
- (d) HBr/H₂O₂, MeMgBr/H[⊕]

- (a) Cu/Δ , $CH_3CH_2MgCl/H_3O^{\oplus}$
- (b) CrO₃,CH₃CH₂MgCl/H₃O[⊕]
- (c) KMnO₄,CH₃CH₂MgCl/H₃O[⊕]
- (d) $Na_2Cr_2O_7/H^{\oplus}$, $CH_3CH_2MgCl/H_3O^{\oplus}$

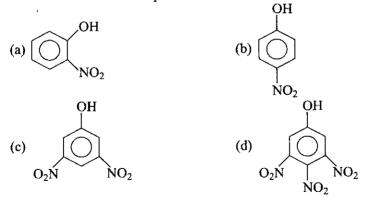
111. Which of the following alcohols will undergo easiest dehydration?

112. The reaction of HBr with the following compound would produce:

113. In the following reactions

Me₂C = CH—CH₂—CH = CH₂ + C₆H₅CO₃H (1 equiv.)
$$\longrightarrow X$$
, X is:
(a)
(b)
(c)
(d)

114. The most steam volatile species is:



- 115. In the Libermann nitroso reaction, changes in the colour of phenol occur as:
 - (a) Brown or red-green-red-deep blue (b) Red-deep blue-green
 - (c) Red-brown-white (d) W
 - (d) White-red-green

116. The alcohol which is most readily dehydrated is:

(a) 2-butanol

(b) 1-phenyl-1-propanol

$$OH \qquad OH \qquad OO$$

117. A compound P (C₇H₈O) is insoluble in water, dilute HCl, NaHCO₃ but dissolve in dilute NaOH. When P is treated with bromine-water, it is converted into a compound of formula C₇H₇OBr. Compound P is:

OCH₃ OH OH OH

(a)
$$(b)$$
 CH_3 (c) CH_3 (d) CH_3

118. In the following sequence of reaction

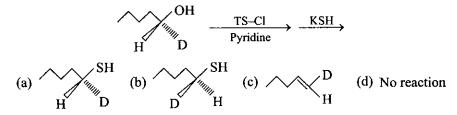
→; Product of the reaction is:

is treated with proton acid, a resonance stabilized cation is produced. Which diene listed below when treated with acid will give the same carbocation?

121. Which of the following would undergo most rapid hydrolysis with aqueous NaOH to furnish the corresponding hydroxy derivatives?

Find out 'A' of the reaction:

123. Identify the major product of reaction:



124. Find the product of following reaction with stereochemistry.

)

125. Select the major product of following reaction:

$$(a) \xrightarrow{O} \xrightarrow{CH_3CH_2O} \xrightarrow{CH_3CH_2O}$$

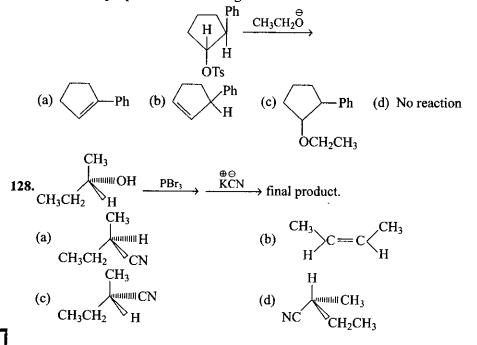
$$(b) \xrightarrow{O} \xrightarrow{O}$$

$$(c) \xrightarrow{O} \xrightarrow{O} \xrightarrow{CH}$$

$$(d) \xrightarrow{CH_3CH_2-OCH_2} \xrightarrow{CH_3}$$

126. What would be the major product of the following reaction?

127. Find out major product of following reaction:



 CH_3

129. What would be the major product of following reaction?

$$H_3C$$
 CH_3
 CH_3
 CH_2SO_4
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3

 CH_3

CH₃

130.
$$OH$$
 $CHCl_3 + NaOH$

A + B(Expected) (Unexpected)

The unexpected product B is:

131. The final product in following reaction is:

$$(c) \begin{picture}(60,0) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0)$$

132. How many structure of final products are possible?

(a) 2 Conc.
$$H_2SO_4 \rightarrow Br_2/CCl_4 \rightarrow C_4H_8Br_2$$
(b) 5 (c) 6 (d) 3

EXERCISE-2 MORE THAN ONE CORRECT ANSWERS

1. Choose incorrect statements regarding the following reaction:

- (a) Syn addition of —H (from BH₃) and —OH (from solution) occur.
- (b) Syn addition of —H (from BH₃) and —OH (from H₂O₂) occur.
- (c) The product is optically active.
- (d) Addition follows anti-Markownikoff orientation.

2.
$$OH \xrightarrow{HBr} Product$$

Which of the following are possible products in significant amounts?

(a)
$$(b) \longrightarrow B_1$$
(b)
$$CH_2 - B_1$$
(c)
$$(d) \longrightarrow (d)$$

3.
$$\langle H_{3C} H \rangle \longrightarrow \langle H_{3C} \rangle$$

Which of the following represent conditions to perform given conversion?

- (a) POCl₃, pyridine
- (b) Na-metal, CS2, heat

(d) CF₃SO₂Cl, pyridine; Me₃CO[⊕]K[⊕]

- 4. Which of the following alcohols do not give white turbidity on treatment with HCl/ZnCl₂?
 - (a) CH_3CH_2OH (b) CH_2-OH CH_3 (c) $N \equiv C CH OH$ (d) $CH_3 C OH$
- 5. Which of the following will give iodoform?
 - (a) CH₃CH₂OH (b) CH₃—CH—Ph (c) OH
- 6. Which of the following ethers will get hydrolysed by HI?
 - (a) \bigcirc O \bigcirc (b) \bigcirc O \bigcirc O \bigcirc CH
- 7. Which of the following reactions are correctly matched?

(a)
$$CH_3 \longrightarrow C \longrightarrow CH_3 \longrightarrow S_{N^1}$$

$$CH_3 \longrightarrow CH_3 \longrightarrow S_{N^1}$$

(b)
$$CH_3 - CH - O - CH_3 \xrightarrow{H^{\bigoplus}/H_2O} S_{N^1}$$
 CH_3

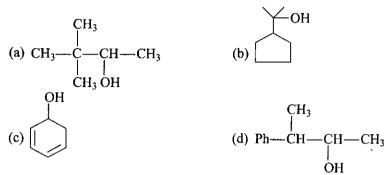
(c)
$$CH_3 - CH - O - CH_3 \xrightarrow{HI} S_{N^2}$$

 CH_3

- (d) $CH_3 --O --CH_2CH_3 \xrightarrow{HI} S_N I$
- 8. Which of the following compounds will give positive Victor Meyer test?
 - (a) CH₃CH₂OH (b) CH₃ C—OH



9. Which of the following alcohols undergo rearrangement during dehydration reaction?



- 10. $C_2H_5OC_2H_{54}$ and \bigcirc OH can be distinguished by :
 - (a) aq. FeCl₂

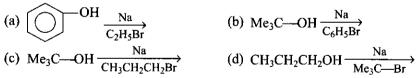
(b) Na metal

(c) Tollen's reagent

- (d) $K_2Cr_2O_7$
- 11. The ether when treated with HI produces:

CH₂OH

12. Which of the following reactions will give ether as main product?



- 13. C_2H_5Br can be converted into C_2H_5 —O— C_2H_5 by :
 - (a) reacting by C₂H₅ONa
- (b) heating with moist Ag₂O
- (c) heating with dry Ag₂O
- (d) treating with C₂H₅MgBr
- 14. 1°, 2° and 3° alcohols can be distinguished by:
 - (a) Cu/573 K

(b) Victor Meyer test

(c) ZnCl₂/HCl

- (d) $Br_2 + H_2O$
- 15. Alcohols can be replaced by —Cl group by the following reagents:
 - (a) Cl₂

(b) SOCl₂

(c) PCl₅

(d) HCl + ZnCl₂

- 16. Glycerol can be converted to acrolein by dehydration in presence of:
 - (a) Conc. H₂SO₄ (b) KHSO₄
- (c) CaCl₂
- (d) Anhyd. ZnCl₂
- 17. CH_3CH_2 —OH can be converted to CH_3CH_2CN by the following reactions :
 - (a) $CH_3CH_2OII + KCN \xrightarrow{\Delta}$
- (b) $CH_3CH_2OH + HCN \xrightarrow{\Delta}$
- (c) $CH_3CH_2OH \xrightarrow{TsCl} \xrightarrow{KCN}$
- (d) $CH_3CH_2OH \xrightarrow{SOCl_2} \xrightarrow{KCN}$
- **18.** Which of the following will oxidise to salt of acid by $Br_2 + KOH$?

(c)
$$CH_{CH_3}$$

(d)
$$\rightarrow$$
 CH₂OH

19.
$$H_{3C} \xrightarrow{H} H \xrightarrow{TsCl} A \xrightarrow{NaBr} B$$

(a)
$$A$$
 is H_3C OTs

(b)
$$B$$
 is H_3C

(d)
$$B$$
 is $H_{3}C$ H

20.
$$\underbrace{\begin{array}{c} \text{Conc. H}_2\text{SO}_4 \\ \Delta \end{array}}_{\text{OH}} A \xrightarrow{\text{O}_3} B \xrightarrow{\stackrel{\Theta}{\text{OH}}}_{\Delta} C$$

(a)
$$A$$
 is CH_3 (b) B is CH_3 (c) C is C

21.
$$OH \xrightarrow{PBr_3} A \xrightarrow{Mg} B \xrightarrow{CH_3 - CH - C - H} OH \xrightarrow{PBr_3} A \xrightarrow{H^{\oplus}/H_2O} B \xrightarrow{CH_3 - CH - C - H} OH \xrightarrow{PBr_3} A \xrightarrow{H^{\oplus}/H_2O} OH \xrightarrow{PBr_3} A \xrightarrow{PBr_4} A \xrightarrow{PBr_4} A \xrightarrow{PBr_4} A \xrightarrow{PBr_4} A \xrightarrow{PBr_4} A$$

(b)
$$B$$
 is \frown MgBr

(c)
$$C$$
 is CH_3

CH₃

22. OH Conc.
$$H_2SO_4$$
 $A + B$ OH

(a) A is OH

(b) A is OC

(c) B is OH

23. OH

(a) A is OH

(b) A is OC

(c) B is OH

(d) B is OH

24. OH

(a) A is OH

(b) B is OH

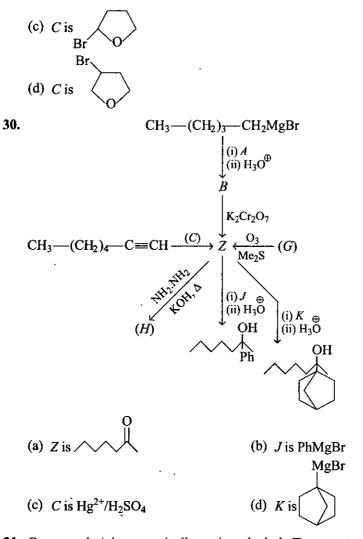
(c) C is OH

(d) D is OH

(e) B is OH

(function of the original of the origi

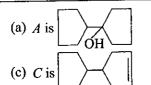


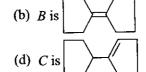


- 31. Compound A is an optically active alcohol. Treatment with oxidising agent converts it to a ketone B. In a separate reaction A is treated with PBr₃, converting it into C. C on reaction with Mg is added to B to yield OMgBr. Identify the correct options.
 - (a) A is 2-butanol

(b) A is 1-butanol

- (c) C is 2-bromobutane
- (d) C is 1-bromobutane
- 32. Alcohol $A(C_{10}H_{18}O)$ is converted into mixture of alkene B and C on heating with conc. H_3PO_4 . Catalytic hydrogenation of B and C yields the same product. Assuming that dehydration of alcohol A proceed without rearrangement. Alkene B on ozonolysis form cyclopentanone. Identify the correct options.





33. A compound 'X'($C_{14}H_{14}O$) on mild oxidation yields $C_{14}H_{12}O(Y)$. If X is treated with a dehydrating agent, it loses a molecule of H_2O and resulting product on vigorous oxidation yield two molecule of benzoic acid. Identify the structure of X and Y.

(d)
$$Y$$
 is Ph — CH_2 — CH_2 — O

34. Compounds A, B and C are isomeric alcohols with formula $C_5H_{12}O$. A on oxidation gives ketone, B gives acid while C is not oxidised, A gives test with I_2/N_4OH . The three isomeric alcohols react with HBr with decreasing rates C > A > B. Identify A and B.

(a)
$$A$$
 is CH_3 (b) A is CH_3 (c) B is CH_3 OH

35. An optically active alcohol A ($C_8H_{16}O$) on oxidation gives B. A on heating gives C (C_8H_{14}) as major product. C on ozonolysis produces D (C_5H_8O) and $CH_3 - C - CH_3$. D on reduction with LiAlH₄ gave O OH. Identify correct O

answers.

(a)
$$D$$
 is

O

(b) B is

CH₃

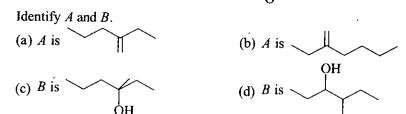
COOH

(c) A is

CH₂OH

(d) C is

36. Compound A (C₇H₁₄) decolourises Br₂ in CCl₄ and reacts with Hg(OAc)₂ followed by reduction with NaBH₄ to produce a resolvable compound B. A undergoes reductive ozonolysis to give as one of the compound.



37. A 3° optically active alcohol $C_9H_{18}O$ 'A' on dehydration with conc. H_2SO_4 produces $B(C_9H_{16})$ which exists in two stereoisomeric forms. For ozonolysis of B followed by work up with $Zn-H_2O$ produces CH_3-C-H and $C(C_7H_{12}O)$. C on treatment H CH_3

with LiAlH₄ produces D (C₇H₁₄O). D on dehydration produced \langle Identify the correct answers.

38. A (C₅H₁₂O) ether, on reaction with PCl₅ form alkyl chloride B and C. B and C both on reaction with aqueous KOH form alcohol D and E. Both D and E give iodoform test. Identify the correct answers.

(a)
$$A$$
 is CH_3CH_2 —O—CH

 CH_3

(b) C is CH_3 — CH — CH_3
 CI

(c) C is $CH_3CH_2CH_2CI$

(d) E is CH_3 — CH — CH_3
 OH

39.
$$OH \longrightarrow Conc. H_2SO_4$$
; Products can be:

(a) $OH \longrightarrow Conc. H_2SO_4$
(b) $OH \longrightarrow Conc. H_2SO_4$
(c) $OH \longrightarrow Conc. H_2SO_4$
(d) $OH \longrightarrow Conc. H_2SO_4$

40. Among the following gemdiols which are stable with respect to corresponding carbonyls:

41. Which of the following reactions are correct?

(a)
$$OC_2H_5$$
 LiAlH₄ OH OH

(b) OC_2H_5 OH OH

(c) OC_2H_5 NaBH₄ OC₂H₅

(d) CH_3 $C \equiv N$ LiAlH₄ CH₃CH₂NH₂

42. Which of the following alcohols will give same alkene on reaction with conc. H₂SO₄?

$$(a) \bigcirc OH \qquad (b) \bigcirc OH \qquad (c) \bigcirc OH \qquad (d) \bigcirc OH$$

43. Which of the following reactions would produce same product?

(a)
$$CCl_4 + NaOH \atop H^{\oplus}/H_2O$$
 (b) $CO_2 + NaOH \atop H^{\oplus}/H_2O$

(c)
$$\xrightarrow{\text{CHCl}_3 + \text{NaOH}}$$
 (d) $\xrightarrow{\text{HCN} + \text{ZnCl}_2}$ $\xrightarrow{\text{HCN} + \text{ZnCl}_2}$

44. Which of the following compounds are oxidised by HIO₄?

(a)
$$CH_2$$
—OH (b) CH_2 —OH (c) H C=O (d) CH_2 —OH CH_2 —OH CH_2 —OH CH_2 —OH CH_2 —OH CH_2 —OH

45. Which of the following esterification reactions are unimolecular?

(a)
$$CH_{3} - C - OH + CH_{3}OH \xrightarrow{H^{\oplus}/H_{2}O}$$

$$CH_{3} O \\ | | | | \\ CH_{3} - C - C - OH + C_{2}H_{5}OH \xrightarrow{H^{\oplus}/H_{2}O}$$

$$CH_{3} \qquad O \qquad Ph \qquad | \\ | | CH_{3} - C - OH + Ph - C - OH \xrightarrow{H^{\oplus}/H_{2}O}$$

$$CH_{3} - C - OH + Ph - C - OH \xrightarrow{H^{\oplus}/H_{2}O}$$

$$OH \qquad HO \qquad H^{\oplus}/H_{2}O \rightarrow OH \qquad HO$$

46. Which of the following reactions involve rearrangement?



47. Which of the following pairs can be distinguished by using Lucas reagent?

(a)
$$\langle _ \rangle$$
 — CH_2 — OH , CH_3CH_2OH (b) $\langle _ \rangle$ — CH_2 — OH , $\langle _ \rangle$ — OH

48. Which of the following compounds are soluble in NaHCO₃?

(a)
$$OH$$
 NO_2 (b) SO_3H (c) OH NO_2 (d) NO_2

49. Which of the following reactions are correctly interpreted?

(a)
$$\longrightarrow$$
 OH $\xrightarrow{\text{TsCl}}$ $\xrightarrow{\text{KSH}}$ \longrightarrow SH

(b) $\xrightarrow{\text{Hg(OAc)}_2}$ $\xrightarrow{\text{HgO, NaBH}_4}$ OH

(c) Ph—C—C—Ph $\xrightarrow{\text{AgNO}_3}$ CH₃—C $\xrightarrow{\text{C}}$ Ph

OH Cl

(d) $\xrightarrow{\text{CH}_2}$ OH— $\xrightarrow{\text{H}_2, \text{Pt}}$ $\xrightarrow{\text{CH}_3}$ CH₃

50. Which of the following reagents can be used for identification of phenol?

(a) Neutral FeCl₃

(b) NaNO₂ + HCl (d) ZnCl₂/HCl

 $(c) (NH_4)_2 [Ce(NO_3)_6]$

EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

Although epoxides do not contain a good leaving group, they contain a strained three-membered ring with polar bonds. Nucleophilic attack opens the strained three-membered ring, making it favourable process even with the poor leaving group.

This reaction occurs readily with strong nucleophile, and with acids like HZ, where Z is nucleophilic atom.

Reaction with H O H
$$\stackrel{\oplus}{CN/H_2O}$$
 H OH Nucleophile opens the Reaction with HZ H $\stackrel{\oplus}{H}$ HCl H $\stackrel{\oplus}{H}$ OH $\stackrel{\oplus}{H}$ Nucleophile opens the $\stackrel{\oplus}{A}$ 3-membered ring $\stackrel{\oplus}{H}$

1. Find out correct product of the reaction:

CH₃

$$CH_3$$

$$C$$

What would be the major product of reaction?

Find out major product of reaction:

S.

3.

Passage-2

1, 2-diols are oxidized to ketones or aldehydes by periodic acid HIO₄. Periodic acid reacts with diol to form a cyclic intermediate. The reaction takes place because iodine is in a highly positive oxidation state, so it readily accepts electrons. When the intermediate breaks down, the bond between the two carbons bonded to the OH groups break.

$$\begin{array}{c} CH_{3} & CH_{3} & CH_{3} & H_{3}C \\ H_{3}C - C - CH - CH_{3} & H_{3}C - C - CH - CH_{3} & H_{3}C \\ OH OH & O & O & H_{3}C & CH_{3} \\ OH OH & O & O & O & O & O \\ OH OH & O & O & O & O \\ OH OH & O & O & O & O \\ OH OH & O & O & O & O \\ OH OH & O & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O \\ OH OH & O & O & O \\ OH OH & O & O & O \\ OH OH & O & O$$

4.
$$\underbrace{\frac{\text{Br}_2}{\text{hv}}}_{\text{A}} A \xrightarrow{\text{alc. KOH}} B \xrightarrow{\text{OsO}_4} C \xrightarrow{\text{HIO}_4} D$$

Identify D.

5.
$$\begin{array}{c} C \longrightarrow O \\ CHOH \xrightarrow{\text{(Excess)}} \\ CHOH \\ CH_2OH \end{array}$$

Which of the following will not form by above reaction?

(b) CH₃OH

(c) CO₂

(d) H—C—OH

6. Which of the following compounds will not react with HIO₄?

HO,

Passage-3

Carbon-oxygen double bond are easily reduced by NaBH₄ or LiAlH₄. The actual reducing agent in these reduction is hydride ion (H).

$$H^{\scriptsize \ominus} \quad \stackrel{\bigcirc C}{\longrightarrow} \quad \stackrel{\bigcirc C}$$

The metal-hydrogen bond in LiAlH₄ is more polar than metal-hydrogen bond in NaBH₄. As a result LiAlH₄ is strong reducing agent than NaBH₄. Esters, carboxylic acids, amides cannot be reduced by NaBH₄.

The carbonyl group of amide reduced to methylene group by LiAlH₄.

7. Find the correct product of the following reaction:

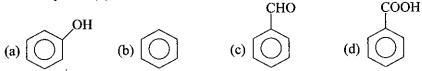
Passage-4

An organic compound (X) on treatment with CHCl₃ and KOH gives (Y) and (Z) both of which in turn gives the same compound (T) when distilled with Zn.

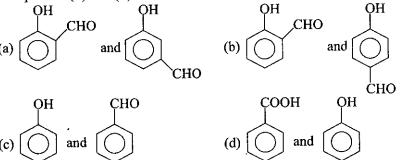
Oxidation of (T) yields (S) of formula $C_7H_6O_2$. The sodium salt of (S) with sodalime gives (P) which can also be obtained by distilling (X).

- 10. The molecular weight of compound (X) is:
 - (a) 122
- (b) 94
- (c) 106
- (d) 78

11. The compound (T) is:



12. Compounds (Y) and (Z) could be:



Passage 5

A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compound J and K. Compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M.

$$M = \begin{array}{c} \text{CH}_3 \\ \text{Ph} \end{array} \begin{array}{c} \text{O} \\ \text{H} \end{array}$$

13. Compound *H* is formed by the reaction of :

14. The structure of compound I is:

(a)
$$\stackrel{Ph}{\underset{Ph}{\longleftarrow}} \stackrel{CH_3}{\underset{Ph}{\longleftarrow}} \stackrel{(b)}{\underset{H}{\longleftarrow}} \stackrel{H_3C}{\underset{Ph}{\longleftarrow}} \stackrel{Ph}{\underset{CH_2Ph}{\longleftarrow}} \stackrel{CH_3}{\underset{CH_2Ph}{\longleftarrow}} \stackrel{H_3C}{\underset{H}{\longleftarrow}} \stackrel{CH}{\underset{H}{\longleftarrow}} \stackrel{CH}{\underset{$$

Passage 6

Alcohols are converted to tosylates by treatment with p-toluene sulfonyl chloride (TsCl) in the presence of pyridine. This overall process converts a poor leaving group

(OH) into good one (OTs). A tosylate is a good leaving group because its conjugated acid p-toluene sulfonic acid is strong acid.

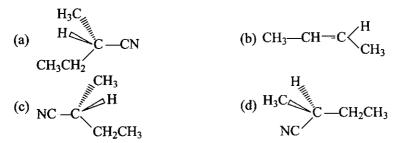
Because alkyl tosylates have good leaving groups, they undergo both nucleophilic substitution and β -elimination.

$$CH_{3}CH_{2} \xrightarrow{OH} + CI - S \xrightarrow{CH_{3}} - CH_{3} \xrightarrow{Pyridine}$$

$$CH_{3}CH_{2} \xrightarrow{O} - CH_{3} + C$$

16. Find the major product of following reaction:

$$\begin{array}{c} H_3C \\ H \\ \hline \\ CH_3CH_2 \end{array} \longrightarrow \begin{array}{c} O \\ CH_3 \end{array} \longrightarrow \begin{array}{c} CH_3 \xrightarrow{Pyrndine} \end{array} \longrightarrow \begin{array}{c} \oplus \ominus \\ KCN \\ \end{array}$$



17. What would be the major product of following reactions?

$$(a) \longrightarrow OH + Ts - Cl \xrightarrow{Pyridine} \xrightarrow{CH_3CH_2ONa} \xrightarrow{CH_3CH_2ONa}$$

$$(b) \longrightarrow OCH_2CH_3$$

$$(c) \longrightarrow OTs$$

$$(d) \longrightarrow O-CH = CH_2$$

18. Identify the final product of following sequence of reactions:

$$(a) \qquad (b) \xrightarrow{\text{TsCl}} \xrightarrow{\text{alc. KOH}} \xrightarrow{\text{OsO}_4} \xrightarrow{\text{HIO}_4} \xrightarrow{\text{OH}}$$

Passage 7

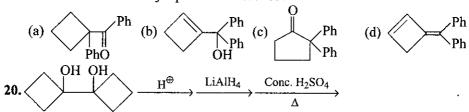
Acid catalysed conversion of 1,2-diol or vicinal diol, into carbonyl compound known as pinacol-pinacolone rearrangement.

•

Generally more electron donating group migrate during mechanism, migration of —H is faster because of its smaller size.

$$\begin{array}{c}
OH \\
Ph \\
Ph \\
OH
\end{array}$$
Dil. H₂SO₄

19. What would be the major product of reaction?



In this sequence of reaction final product is:

21. Which of the following is not correct about this rearrangement?

(a) Migratory order for substituent in phenyl is
$$\bigcirc R$$
 $\bigcirc R$ $\bigcirc R$ $\bigcirc R$

- (b) The carbocation is stabilised by 1,2-shift
- (c) Migratory aptitude for substituent is in $R \longrightarrow H \longrightarrow C_6H_5$
- (d) Product of reaction is carbonyl compound.

Passage 8

Compound (A) $C_{10}H_{22}O_2$ is insoluble in aq. NaOH but not in NaHCO₃.

Treatment of (A) with DMSO (CH₃—S—CH₃) in alkali give (B) $C_{11}H_{14}O_2$. Treatment of (A) with strong alkali alone give an isomeric compound (C). When (A) is refluxed with HI, CH₃I is obtained, compound (B) is insoluble in alkali and decolourises Br_2/CCl_4 . (B) on treating with strong base gives (D), an isomer of (B). Ozonolysis (C) of gives (E), $C_8H_8O_3$ and isomer of vanilline. Ozonolysis of (D) gives (F) $C_9H_{10}O_3$, which is identical with product of methylation of vanilline (4-hydroxy-3-methoxy benzaldehyde).

22. Structure of compound (A) is:

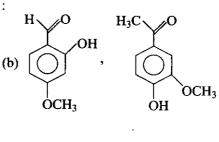
23. Compound (*B*) is :

OCH₃

CHO

(d)
$$H_3CO$$
 O — CH_2 — CH = CH_2

24. Compound (E) and (F) are respectively:



(d) None of these `CH₂OH OCH₃

MATRIX MATCH TYPE

Column (I) ЮH 1. (a)

Column (II)

- (b) CH₃CH₂OH
- (c) CH₃—CH—OH Ph

ÓΗ

- P. White turbidity with HCl/ZnCl₂
- Q. Violet colour with FeCl₃
- R. Colour change of $Na_2Cr_2O_7$, H^{\oplus}

$$(d) \ CH_{3} - C - OH \qquad S. \ I_{2} / O^{\odot}H, \text{ gives bright yellow ppt.}$$

$$O \qquad \qquad O \qquad \qquad O$$

$$CH_{3} \qquad \qquad OH \qquad P. \text{ Involve carbocation formation}$$

$$(b) \ CH_{3} - C - O - CH - Ph \longrightarrow Q. \text{ Acyl cleavage}$$

$$(c) \ CH_{3} - C - O - CH - Ph \longrightarrow Q. \text{ Acyl cleavage}$$

$$(c) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(d) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Involve earbocation formation}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Involve earbocation formation}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(e) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(f) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Racemic mixture}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ CH_{3} - C - CH_{3} \longrightarrow R. \text{ Rearrangement}$$

$$(g) \ C$$

(d) Ph—C—CH—CH₂—CH₃
$$\xrightarrow{\text{Conc. H}_2\text{SO}_4} S$$
. Bimolecular elimination

- 5. (a) Oxidation of 1° alcohol in aldehyde

 - (d) Oxidation of alkyne into acid
- 6. (a) Identification of 1°, 2° and 3° Alcohol
 - (b) Identification of 1°, 2° and 3° Nitroalkane Q. Cu/300°C, Δ
 - (c) Formation of alcohol by anti-Markownikoff's R. Victor Meyer test addition
 - (d) Formation of alcohol by Markownikoff's addition
- 7. (a) Phenol + Neutral FeCl₃
 - (b) Phenol + Br_2 (aq.)
 - (c) Phenol + NaHCO₃
 - (d) Pieric acid + NaHCO₃
- - (b) $CH_3 C C O Ph \xrightarrow{H^{\oplus}/H_2O} Q$. Bimolecular CH_3

(d)
$$CH_3$$
— O — CH — CH_3 — HI
 CH_3

- $P. \text{ KMnO}_4, \Delta, OH$
 - Q. Collin's reagent
 - R. Jone's reagent
 - S. pcc
 - P. Oxymercuration demercuration react

 - - S. Hydroboration oxidation
 - T. Lucas test
 - P. No reaction
 - Q. Violet colour
 - R. White ppt.
 - S. CO₂ gas is evolved
 - P. Unimolecular

 - R. Alkyl oxygen bond cleavage
 - S. Acyl oxygen bond cleavage

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS



1. How many compounds A through G are enol tautomers of 2-butanone.

2. Consider the pairs of ethers A through F show below. To the right of each pairs is a description of reaction conditions to be applied to each. One compound of the pair will react more rapidly than the other. Find out number of reactions in which first ether more rapidly cleaved than second.

Ether pairs

Conditions

(CH₂)₃-O-CH₃

3. Find out number of moles of HIO₄ that will react with following compound.

6.
$$R$$
— CH_2 — OH — $?$ R — CH_2 — CI

Find out number of reagents that can be used for above conversion, from following.

7. Identify numbers of alcohol those will show rearrangement during dehydration with concentrate H₂SO₄.

8. Find out number of reagents that converts 1° alcohol to aldehyde.

9. Find out number of alcohols that can give positive iodoform test.

10. How many moles of HI reacts with glycerol to give 2-iodopropane.

Alcohols and Ethers 343



ANSWERS



Exercise-1: Only One Correct Answer

Level	-1																			
1. (d)	2.	(d)	3.	(a)	4.	(a,b)	5.	(b))	6.	(c)	7	, (b	8.	(a)	9.	(b)	10.	(d)
11. (d)	12.	(b)	13,	(d)	14.	(c)	15.	(b))	16.	(c)	17	. (d	18.	(a)	19.	(a)	20.	(c)
21. (a)	22.	(a)	23.	(c)	24.	(b)	25.	(a,b,	c)	26.	(p)	27	, (c	28.	(c)	29.	(b)	30.	(c)
31. (b)	32.	(b)	33.	(d)	34.	(c)	35.	(b))	36.	(b)	37	. (b	38.	(a)	39.	(b)	40.	(b)
41. (b)	42.	(s)	43.	(c)	44.	(b)	45.	(c))	46.	(d)	47	. (c	48.	(b)	49.	(b)	50.	(d)
Level	 -2																	,		
1. (b)	2.	(a)	3.	(b)	4.	(c)	5.	(c)	E	, (c)	7.	(a)	8.	(c)	9.	(d)	10.	(d)
11. (12.		13.			(c)	15.	(a)	16	i (a)	17.	(c)	18.	(c)	19.	(b)	' 20.	(c)
21. (d)	22.	(b)	23.		24.	(a)	25.	(a)	26	i. (b)	27.	(c)	28.	(d)	29.	(c)	30.	(c)
31. ((c)	32.	(a)	33.	(b)	34.	(b)	35.	(a)	36	ķ (c)	37.	(b)	38.	(a)	39.	(b)	40.	(a)
41. (b)	42.	(c)	43.	(b)	44.	(b)	45.	(a)	46). (c	(:	47.	(a)	48.	(b)	49.	(c)	50.	(b)
51. ((c)	52.	(a)	53.	(d)	54.	(c)	55.	(a)	56	ъ (а)	57.	(d)	58.	(b)	59,	(d)	60.	(c)
61, (d)	62.	(d)	63.	(c)	64.	(d)	65.	(d)	66	j. (0)	67,	(b)	68.	(d)	69.	(c)	70.	(a)
71. (a)	72.	(b)	73.	(b)	74.	(b)	7.5.	(c)	76	. (a)	77,	(d)	78.	(a)	79.	(a)	80.	(b)
81. (d)	82.	(c)	83.	(a)	84.	(b)	85.	(b)	86	š. (c)	87.	(a)	88.	(c)	89.	(b)	90.	(c)
91. (92.		93.			(p)		(c)		Š. (a			(d)		(b)			100.	
101. ((a)	102.	(c)	103.	(c)	104.	(c)	105.	(d)	106	3. (b) 1	07.	(a)	108.	(c)	109.	(a)	110,	(a)
111. (d)	112.	(b)	113.	(c)	114.	(a)	115.	(b)	116	3. (t) 1	17,	(c)	118.	(c)	119.	(b)	1,20.	(b)
121. ((a)	122.	(c)	123.	(b)	124.	(c)	125.	(d)	126	à. (a) 1	27.	(b)	128.	(c)	129,	(b)	1.30	(c)
<u>131.</u> (a)	132.	(b)															_		

Exercise-2: More Than One Correct Answers

1 1	(a, c)	ž	(b, c, d)	3	(h.c.d)	4	(a, c)	5 .	(a, b, d)	Ĝ.	(c, d)
									(a, d)		
									(c, d)		
											(a, c)
25.											(a, b, c, d)
											(a, c)
									(a, c, d)		
43.											(a, b, d) '
49.	(a, c, d)	50.	(a, b, c)								

Exercise-3: Linked Comprehension Type

1. (b)	2. (c)	3. (a)	4. (d)	5, (b)	6. (c)	7. (c)	8 . (b)	.9. (d)	10 . (b)
11. (c)	12, (b)	13, (b)	14. (a)	15. (d)	16. (c)	17. (a)	18. (b)	19 . (c)	20 . (d)
21. (c)	22. (c)	23. (b)	24. (a)						1

Exercise-4: Matrix Match Type

	<u></u>			
1. (a) → Q;	(b) $\rightarrow R,S$;	(c) → P, R, S;	(d) → P	
2. (a) → 0, S;	(b) $\rightarrow P, R, S$;	(c) $\rightarrow P$, S;	(d) $\rightarrow P, R$	•
3. (a) $\rightarrow P, Q, R, S$;	(b) $\rightarrow R$, S	(c) $\rightarrow P, Q, S$;	(d) $\rightarrow P$, S	1
4. (a) → P. S;	(b) $\rightarrow O, R$;	(c) $\rightarrow P.S$;	$(d) \rightarrow Q, R$	1
5. (a) → Q, R, S;	(b) → \$;	(c) \rightarrow 0;	$(d) \to P$	
6. (a) $\rightarrow Q, R, T$;	(b) $\rightarrow R$;	(c) → S; -	$(d) \rightarrow P$	l
7. (a) → Q;	(b) $\rightarrow R$;	(c) $\rightarrow P$;	(d) → S	ì
8. (a) $\rightarrow P, R$;	(b) $\rightarrow P.S$:	(c) $\rightarrow P.R$:	(d) $\rightarrow O, R$	1

Exercise-5: Integer Answer Type Problems

1. (3, A B F)	2. (3, B C F)			7. (6)	
9. (4) 10. (5)					1
•		 	 		



(a) acetone

(c) diethyl ketone

Carbonyl Compounds

EXERCISE 1 **ONLY ONE CORRECT ANSWER**





	Male All Electrical All All All All All All All All All A
1. Which of the following reagents may	be used to accomplish the conversion?
$C_6H_5CH = CH - CH_2OH - C_6H$	
(a) $[(CH_3)_3CO]_3AI$, \longrightarrow OH	(b) $\stackrel{+}{\bigcirc}$ H ClCrO $_3^-$
(c) MnO ₂	(d) All of these
2. The major product obtained from pl (in excess) is hydrolyzed with aquec with PCC. The final product formed	notochemical chlorination of ethylbenzene bus KOH and the product is then oxidized is:
(a) PhCH ₂ CHO (b) PhCOCH ₃	(c) PhCHO (d) PhCOOH
3. A compound (A), $C_4H_8Cl_2$, on hyd	rolysis gives a product (B) which forms a
	uce Tollen's reagent. The compound (A) has
the structure : (a) CH ₃ CH ₂ CHClCH ₂ Cl	(b) CH ₃ CH ₂ CCl ₂ CH ₃
	(d) CH ₃ CHCICHCICH ₃
4. Which of the following compounds of	loes not react with NaH5O3 ?
(a) C_6H_5CHO (b) C_6H_5COCH	3 (d) CH ₃ COCH ₃ (d) C ₂ H ₅ COC ₂ H ₅
5. Which of the following will not under	ergo aldol condensation? (b) Propionaldehyde
(a) Acetaldehyde(d) Trideuterio acetaldehyde	(d) Benzaldehyde
6. In the Cannizzaro reaction, which is	
$2 \text{ PhCHO} \xrightarrow{\text{OH}^-} \text{PhCH}_2\text{OH} + \text{PhCO}$	0
 (a) The attack of OH⁻ at the carbox; (b) The transfer of hydride to the carbox; (c) The abstraction of proton from the carbox; (d) The department of PhCH, OH 	rbonyl group he carboxylic acid
(d) The deprotonation of PhCH ₂ OH	n hydrolysis gives an $lpha$ - hydroxy acid which
shows optical activity after resolution	

(b) formaldehyde

(d) acetaldehyde

- 8. Acetaldehyde on treatment with a few drops of concentrated H₂SO₄ gives:
 - (a) CH₃CHOHCH₂CHO
- (b) CH₃CH=CHCHO

(c)
$$CH_3 \longrightarrow CH_3$$

- 9. Phenylglyoxal, C₆H₅COCHO, on heating with concentrated NaOH gives:
 - (a) C₆H₅COONa and CH₃OH
- (b) C₆H₅CH₂OH and HCOONa
- (c) C₆H₅CHOHCOONa
- (d) C₆H₅COONa and HCOONa
- 10. The most appropriate reagent for the conversion of 2-pentanone into butanoic acid is:
 - (a) chromic acid

(b) acidified KMnO₄

(c) alkaline KMnO₄

- (d) sodium hypochlorite
- 11. 2-Methylcyclohexanone is allowed to react with metachloroperoxobenzoic acid. The major product formed in the reaction is:

(d)

12. Consider the following sequence of reactions.

$$CH_3COCH_3 \xrightarrow{Ba(OH)_2} A \xrightarrow{H_2SO_4} B \xrightarrow{NaBH_4} C$$

The final product (C) is:

 CH_3

- (a) $(CH_3)_2C(OH)CH_2COCH_3$ (b) $(CH_3)_2C=CHCOCH_3$ (c) $(CH_3)_2CHCH_2CHOHCH_3$ (d) $(CH_3)_2C=CHCHOHCH_3$
- 13. Among the following compounds, the one which can undergo both aldol condensation and Cannizzaro reaction is:
 - (a) (CH₃)₂CHCHO

(b) HCHO

(c) C_6H_5CHO

- (d) CH₃CHO
- 14. Consider the following sequence of reactions.

Ketone
$$A \xrightarrow{\text{1. C}_2\text{H}_5\text{MgBr}} B \xrightarrow{\text{H}_2\text{SO}_4 \cdot \text{Heat}} C \xrightarrow{\text{1. O}_3} C \xrightarrow{\text{2. Zn}, \text{H}_2\text{O}} + \bigcirc$$

The ketone (A) is:

- 15. The reaction of C₆H₅CH=CHCHO with NaBH₄ gives:
 - (a) C₆H₅CH₂CH₂CH₂OH
- (b) $C_6H_5CH = CHCH_2OH$
- (c) C₆H₅CH₂CH₂CHO
- (d) C₆H₅CH₂CHOHCH₃

16.
$$C \equiv CH \xrightarrow{D_2O, H_2SO_4} P$$

The principal organic product P is:

(a) $-\text{COCH}_2\text{D}$

- (b) COCHD₂
- (c) CD₂—CHO
- (d) —CHD—CHC
- 17. Which one of the following is mixed ketone?
 - (a) $CH_3 C CH_3$

(b) CH₃—CH₂—C—CH₃

(c) $C_6H_5 - C - CH_3$

- (d) $CH_3 C_6H_4 C C_6H_5$
- 18. Which one of the following alcohols cannot be oxidized by K₂CrO₄?
 - (a) Ethanol

(b) Tert butyl alcohol

(c) Isopropyl alcohol

(d) Allyl alcohol

19. In the given reaction:

$$\begin{array}{ccc}
\text{OH} & \text{OH} \\
& | & | \\
\text{CH}_3 & \xrightarrow{\text{CH}} & \text{CH}_3 & \xrightarrow{\text{HIO}_4} & (A) + (B) \\
& & | & & \\
\text{CH}_3 & & & \\
\end{array}$$

- (A) and (B) respectively be:
- (a) CH₃CHO and CH₃CHO
- (b) CH₃COCH₃ and CH₃CHO
- (c) CH₃COCH₃ and CH₃COCH₃
- (d) CH₃COOH and CH₃COCH₃
- 20. Acetophenone can be obtained by the distillation of:
 - (a) $(C_6H_5COO)_2Ca$
 - (b) (CH₃COO)₂Ca
 - (c) $(C_6H_5COO)_2Ca$ and $(CH_3COO)_2Ca$
 - (d) (C₆H₅COO)₂Ca and (HCOO)₂Ca

- 21. Arrange these compounds in decreasing order of reactivity for the nucleophilic addition reaction.
 - (I) Acid chloride (II) Aldehyde

(III) Ketone (IV) Ester

(a) I > II > III > IV(c) III > II > I > IV

- (b) IV > II > II > I(d) I > IV > II > III
- 22. Two isomeric ketones, 3-pentanone and 2-pentanone can be distinguished by:
 - (a) I₂/NaOH only

(b) NaSO₃H only

(c) NaCN/HCl

- (d) Both (a) and (b)
- 23. In the reaction sequence

$$C_6H_5 \longrightarrow C \longrightarrow CH_3 \xrightarrow{NH_2OH/H^{\circ}} [X] \xrightarrow{PCl_5} [Y], [Y] \text{ will be}:$$

O O O O
$$||$$
 (a) $C_6H_5-C-NHCH_3$ (b) $CH_3-C-NH-C_6H_5$ (c) $C_6H_5-CH_2-C-NH_2$ (d) Mixture of (a) and (b)

(b)
$$CH_3 - C - NH - C_6H_5$$

(c)
$$C_6H_5$$
— CH_2 — $\overset{||}{C}$ — NH_2

- 24. Schiff's base is prepared from:
 - (a) carbonyl compound and primary amine
 - (b) carbonyl compound and secondary amine
 - (c) carbonyl compound and tertiary amine
 - (d) all of the above
- 25. Schiff's reagent is used for the differentiation between:
 - (a) HCHO and CH₃CHO
 - (b) CH₃COCH₃ and CH₃CHO

(c)
$$C_6H_5$$
— CH_2 — C — CH_3 and C_6H_5 — C — CH_2 — CH_3

- (d) HCHO and C₆H₅CHO
- 26. Fehling solution gives red precipitate with:
 - (a) aromatic aldehyde

- (b) saturated aliphatic aldehyde
- (c) unsaturated aliphatic aldehyde (d) both (b) and (c)
- 27. Silver mirror test with Tollen's reagent is given by:
 - (a) C₆H₅CHO

- (b) $CH_2 = CH CHO$
- (c) C_6H_5 —CH=CH—CHO
- (d) all of these
- 28. Acetone can be converted into pinacol by:
 - (a) Mg/Hg/H₂O

(b) Zn/Hg/HCl

(c) Na/Hg/H₂SO₄

(d) all of these

with ethanol is:

	(a) an aldol	(b)	an acetal	
	(c) a ketal	(d)	a hemiacetal	
30	Perkin reaction is catalysed by:			
50.	(a) NaOH (b) HCl	(c)	NH ₄ Cl	(d) Pyridine
21	Product of Perkin reaction is:	(-)	**	•
31.				
	(a) α , β - unsaturated aldehyde	ehve.	ما	
	(b) β -cyclohexyl, α , β - unsaturated ald	Citye	iC .	
	(c) β - Aryl - α, β - unsaturated acid			
	(d) all of the above			
32.	In the given reaction			
	,	ΟĮ	-I	
	$C_6H_5CHO + X \xrightarrow{\text{(ii) Zn}} C_6H_5 - C_6H_5$	– C1	н—СН ₂ —СО	OC_2H_5 , [X] will be:
	(a) $CH_3 - COOC_2H_5$		$CH_3 - CH_2 -$	-COOC ₂ H ₅
	(c) $Br - CH_2 - COOC_2H_5$	(d)	Br CH—CO	OC ₂ H ₅
	(c) Bi Cit ₂ COOC ₂ 113	(-)	Br	- 2 J
			DI	
33.	Cannizzaro reaction is example of:			
,	(a) redox reaction		disproportiona	
	(c) both (A) and (B)	(d)	only oxidation	l
34.	Cross Cannizzaro reaction is an examp	le o	f:	
	(a) redox reaction	(b)	disproportiona	ition
	(c) both (a) and (b)	(d)	oxidation	
35.	Which will give silver mirror test with	Tol	len's reagent?	
	(a) C ₆ H ₅ CHO	(b)	CH_3 —CHO	
	(c) HCOOH	(d)	All of these	
36.	Acetaldehyde cannot give :			
	(a) Iodoform test		Lucas test	
	(c) Benedict test	(d)	Tollen's test	
37.	. The reaction in which NaCN/C ₂ H ₅ OI	H/H	OH is used is:	
	(a) Perkin reaction	(þ)) Benzoin cond	ensation
	(c) Reimer-Tiemann reaction	(ď	Rosenmunds:	reduction
20	. Which one of the following reactions			
30	hydrocarbons?			
	(a) Aldol condensation	(b) Wolf Kishner	reduction
	(c) Reimer-Tiemann reaction) Perkin reaction	
20	. Schiff's ragent gives pink colour wit	-	,	
39	(a) acetaldehyde	ц, (h) acetone	
) methyl acetat	e
	(c) acetic acid	ųα	,	

40. Consider the structure of given alcohol, This alcohol can be prepared from :

- (a) C_6H_5 C— CH_3 and C_2H_5MgBr
- (b) CH_3 — CH_2 —C— CH_3 and C_6H_5 MgBr
- (c) $C_6H_5 \stackrel{O}{---} C_2H_5$ and CH_3MgBr
- (d) all of the above
- **41.** In the given reaction, [X] will be:

$$C_6H_5 - C - H \xrightarrow{NH_2OH/H^{\oplus}} [X]$$

(a) only syn oxime

- (b) only anti oxime
- (c) mixture of syn and anti oxime
 - (d) secondary amide
- **42.** In the reaction sequence, [X] is which keton?

$$[X] \xrightarrow{\text{KMnO}_4/\mathring{\text{O}}\text{H}/\Delta} \text{HOOC} - (\text{CH}_2)_3 - \text{CH} - \text{COOH}$$
(a)
$$(b) \xrightarrow{\text{CH}_3} \text{CH}_3$$
(b)
$$(c) \xrightarrow{\text{CH}_3} \text{CH}_3$$
(d)
$$(d) \xrightarrow{\text{CH}_3} \text{CH}_3$$

43. In the given reaction, [X] will be:

$$\begin{array}{c}
O \\
CH_3 \\
\longrightarrow [X]
\end{array}$$

(a)
$$O$$
 CHO
(b) O CH₃
(c) O CH₃
(d) O CH₃

44. What is the given reaction known as?

$$CH_3 \xrightarrow{C} CH_3 \xrightarrow{C_6H_5CO_3H} CH_3 \xrightarrow{C} C -CH_3$$

- (a) Bayer-villiger oxidation
- (b) oppenaur oxidation

(c) Periodate oxidation

- (d) Peroxide oxidation
- 45. In the given reaction, (X) and (Y) will respectively be:

$$X + Y \xrightarrow{\text{NaOH}} \text{CH}_3 \xrightarrow{\text{CH}} \text{CH} \xrightarrow{\text{CH}} \text{CHO}$$

(a)
$$CH_3 - CH_2 - CHO$$
 and $CH_3 - CH_2 - CHO$

(b) CH₃—CHO and CH₃—CH₂—CHO (c) CH₃—CHO and CH₃—CHO

46. Which of the following compounds are in their most stable tautomeric forms?

47. Which of the following compounds have higher enolic content than keto content?

(a)
$$CH_3 - C - C - CH_3$$
 (b) O (c) (d) (d)

48. In which of the following pairs, the first one will have a higher enol content than the second one?

49. Tautomer of the following compound is:

(c)
$$CH-CH=CH$$
OH
OH
OH
OH
OH
OH
OH

50.
$$(i) \operatorname{Br}_2, \operatorname{H}^+ \longrightarrow P, P \text{ will be}:$$

(c)
$$OC_6H_5$$

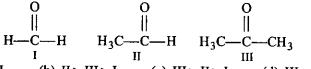
- 51. Which of the following is an example of aldol condensation?
 - (a) 2CH₃CHO dil. NaOH CH₃CHOHCH₂CHO
 - (b) HCHO dil. NaOH CH3OH
 - (c) $C_6H_5CHO + HCHO \xrightarrow{\text{dil. NaOH}} C_6H_5CH_2OH$
 - (d) $2CH_3COCH_3 \xrightarrow{Conc. NaOH} CH_3C(OH)(CH_3)CH_2COCH_3$
- 52. Which of the following would undergo aldol condensation?

(c) CH₃CH₂CHO

(d) HCHO

LEVEL-2

1. Mark out the correct order of dipole moment for the following compounds:



- (a) I > II > III
- (b) II > III > I
- (c) III > II > I
- (d) III > I > II
- 2. Arrange the following compounds in decreasing order of nucleophilic addition reaction:

- (a) II > IV > III > I
- (c) IV > III > II > I

- (b) I > II > III > IV
 - (d) II > III > IV > I
- 3. Arrange the following compounds in decreasing order of nucleophilic addition reaction:

- (a) II > V > I > IV > III
- (c) II > I > V > III > IV

4. In the given reaction sequence
$$C_6H_5CHO \xrightarrow{H_2N-OH} A \xrightarrow{P_2O_5} B$$

A and B respectively are:

(a) C_6H_5 —CH = N— OH, C_6H_5CN

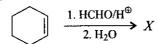
(b)
$$C_6H_5$$
— $CH=N$ — OH , C_6H_5 C — NH_2

- (c) C_6H_5 —CH=N—OH, C_6H_5 CHO (d) C_6H_5 —CH=N—OH, C_6H_5 —COOH
- Consider the following reaction

$$\stackrel{\text{H}}{\longrightarrow} \stackrel{\text{OH}}{\longrightarrow} \stackrel{\text{H}_{\oplus}}{\longrightarrow} \stackrel{\text{OH}}{\longrightarrow}$$

The above reaction is an example of:

- (a) intermolecular hemiacetal formation
- (b) intramolecular hemiacetal formation
- (c) intermolecular acetal formation
- (d) intramolecular acetal formation
- 6. In the given reaction



X is:

(a)
$$OH$$
 (b) OH (c) OH (d) OH

- 7. Secondary amine react with carbonyl compound to give:
 - (a) Imine
- (b) Schiff's base
- (c) Hydrazone
- (d) Enamine

8. In the given reaction

$$\begin{array}{c}
 & \text{HCN} \\
 & \xrightarrow{\text{H}_2\text{O}}
\end{array}$$

$$A \xrightarrow{\text{LiAlH}_4} B$$

A and B will respectively be:

9. Arrange the compounds in order of decreasing reactivity for nucleophilic addition reaction:

(a) I > IV > II > III

(b) I > II > III > IV

(c) II > III > I > IV

(d) II > I > III > IV

10. In the given reaction

$$\begin{array}{c}
 & \xrightarrow{\text{H}_2\text{O}/\text{H}^{\oplus}} (P) + (Q)
\end{array}$$

Identify P and Q:

(c)
$$\stackrel{HO}{\smile}_{C-H}$$
 and $\stackrel{OH(d)}{\smile}_{OH(d)}$ All of these

11. Which carbonyl group of the given compound is most reactive for nucleophilic addition reaction?



(a) 1

(b) 2

(c) 3

- (d) All have equal reactivity
- 12. Which carbonyl compound has maximum dipole moment?





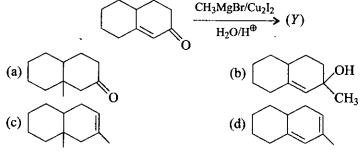




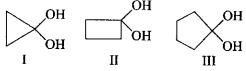
13. In the given reaction the main product will be:

(a)
$$CH_3MgBr \atop NH_4CI/H_2O$$
 (b) OH CH_3 (c) (d)

14. In the given reaction the main product will be:



15. Arrange the stability of given gemdiols in decreasing order:



- (a) III > II > I
- (b) I > II > III
- (c) III > I > II
- (d) I > II > I
- 16. Which one of the following compounds would form most stable hydrate?
 - (a) Cl₃C—C—H

(b) H₃C—C—H

- 17. Which of the following structures contains a hemiacetal group?
 - HO. (a)

H₃C_\ O_\ (b)

OH (c) H₃C—C—CH₃ OCH₃

- 18. Which of the following compounds would give positive Fehling's solution test?
 - (a) $C_6H_5--C--CH_3$

- OCH_3
- (c)
- OH (d)
- 19. Which of the following carbonyl compounds when treated with dilute acid forms a stable cation?
 - (a) H₃C-

- 20. In the given reaction
 - -O---CH₂CH₃-

P will be:

OH (a)

(c)

CH₂OH (d)

21.
$$O \xrightarrow{H_2O/H^{\oplus}} (X)$$

(X) will be:

22. In the given reaction

$$\begin{array}{c}
O \\
Cl \xrightarrow{PhMgBr} (X)
\end{array}$$

(X) will be:

23. In the given reaction

$$\frac{\text{NBS}}{\text{ether}} \xrightarrow{\text{EO}_2} \frac{\text{CO}_2}{\text{H}^{\oplus}/\text{H}_2\text{O}} (X)$$

(X) will be:

OH

24. What are A, B and C in the given reaction?

$$C \xleftarrow{H_2, \text{Ni}} \qquad \xrightarrow{\text{H}_2 \text{ (1 equivalent)}} A$$

$$\downarrow \text{LiAlH}_4$$

OH

(c)
in all cases

O
OH
OH
(d)
$$(A)$$

$$(B)$$

$$(C)$$

Identify
$$Q$$
:

26. Which one of the following combinations gives compound (X)?

Identify structure of B:

27.

28.
$$H_3C$$
— C — H + HS — \longrightarrow $A \xrightarrow{1. \text{BuLi}} 2. H_3C$ — Br \longrightarrow $A \xrightarrow{3. \text{HgCl}_2/H_3^{\oplus}} E$

Identify structure of B:

29.

(a)
$$(b)$$
 (c) (d) (d)

Identify structure of Y:

(a)
$$C = C CH_3$$

$$C = C CH_3$$

$$C = C - CH_3$$

(c)
$$\subset$$
 CH—CH₃

$$(d) \bigcirc C = C \bigcirc H$$

30.
$$NaCN \rightarrow (X)$$

(X) is:

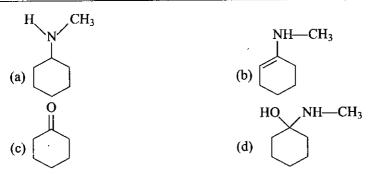
31. In the given reaction

$$Br \xrightarrow{O} \frac{1. \text{ CH}_3\text{MgBr}}{2. \text{ H}_3^{\oplus}\text{O}} (X)$$

(X) will be:

32.
$$\xrightarrow{PCC} \xrightarrow{CH_3NH_2} \xrightarrow{H_2/Pd-C} (P)$$

P will be:



33. In the given reaction

$$(a) \qquad (b) \qquad (c) \qquad (d) \qquad (d) \qquad (d)$$

34. Find the product of the following reaction:

$$CH_{3} \xrightarrow{NH_{2}-NH_{2}/KOH} \xrightarrow{\Delta}$$

$$CH_{3} \xrightarrow{CH_{2}-CH_{2}-CH_{3}} \xrightarrow{CH_{3}}$$

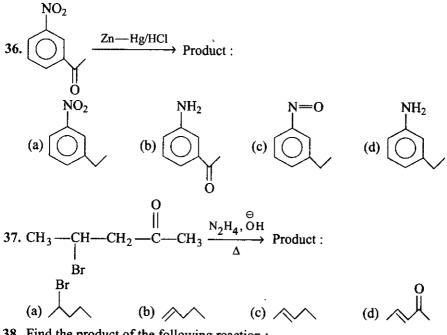
$$CH_{3} \xrightarrow{CH_{3}} \xrightarrow{CH_{3}}$$

$$CH_{3} \xrightarrow{CH_{3}} \xrightarrow{CH_{3}}$$

(c)

HO

(a)



38. Find the product of the following reaction:

$$(a) \qquad F \qquad OH \qquad OH \qquad OH \qquad NO_2$$

$$(b) \qquad OH \qquad NO_2 \qquad (c) \qquad HS \qquad H^{\oplus} \qquad H^{\oplus} \qquad H_2, Ni \qquad Product$$

$$(a) \qquad HS \qquad H^{\oplus} \qquad H_2, Ni \qquad Product$$

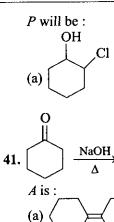
Find out final product of reaction:

$$(a) \xrightarrow{Ph} S \qquad (b) \xrightarrow{Ph} C = O$$

$$(a) \xrightarrow{H} S \qquad (c) \xrightarrow{Ph} S \qquad (d) \xrightarrow{Ph} C = O$$

,Cl

(d)



(c)

(c)

42. What is the product (X) of the following reaction?

(b)

Find out the structure of
$$X'$$
:

44. Find the product of following reaction:

45. Find the major product of given reaction:

What is (A)?

47. Which of the following is an example of aldol condensation reaction?

(c)
$$+ \text{Me}_2\text{NH} \longrightarrow N$$

(d) 2 $\xrightarrow{\text{Ba}(\text{OH})_2} \xrightarrow{\text{O}}$

48. Consider the following sequence of reaction

$$\frac{1. \text{ Cold KMnO}_4}{2. \text{ HIO}_4} A \xrightarrow{\text{NaOH}} B$$

The product B is:

49. Consider the following sequence of reaction

$$\xrightarrow{\text{1. O}_3} A \xrightarrow{\text{NaOH}} B$$

Product A and B respectively:

Reactant (A) and product (B) are respectively:

50.

54. How many products will obtain in the following reaction?

Ph—CHO +
$$+$$
 C—H NaOH
(a) 2 (b) 3 (c) 4 (d) 1

55. Find out no. of products produced in following reaction:

56. 2 $\mid \xrightarrow{\text{NaOH}} P + Q$

(a) 1

P and Q are respectively:

$$CH_2$$
—OH $COO^{\ominus}Na^{\oplus}$
(a) | and | $COO^{\ominus}Na^{\oplus}$
 $COO^{\ominus}Na^{\oplus}$
 $COO^{\ominus}Na^{\oplus}$

$$\begin{array}{c|ccc} CH_2OH & CH_2OH \\ \hline (b) & and & \\ \hline COO^{\ominus}Na^{\oplus} & COO^{\ominus}Na^{\oplus} \\ \hline CH_2OH & both \\ \hline COO^{\ominus}Na^{\oplus} & \\ \end{array}$$

(d) 2

57.
$$+ Ph_3P = CH_2 \longrightarrow A$$

A is:

58.
$$H_3C$$
— CH_2 — CH_2 — CH_2 — CH_2 — PPh_3 $\xrightarrow{\Theta Bu Li}$ Δ (X) ; Major product (X) is:



60.

59.
$$Cl \xrightarrow{1.2Ph_3P} A \xrightarrow{H} \Delta B$$

Find out structure of B:

(a) (b) (c) (d) (d)
$$\frac{2Ph_3P}{PhLi} \times X \xrightarrow{2CH_3-C-H} Y$$

Identify structure of 'Y':

- - (a) (b) (c) (d)
- 62. Which halide will give Wittig reaction?

(a)
$$+CI$$
 (b) $\langle \rangle -CI$ (c) $H_2C=CH-CI$ (d) $\rangle -CI$

63. Find the product of following reaction

$$\begin{array}{c|c}
O & & & & & \\
\parallel & & & & & \\
2CH_3CH_2 - C - OC_2H_5 & \xrightarrow{H_2^{\oplus}O} (X)
\end{array}$$

(a)
$$CH_3$$
— CH_2 — C — CH — C — CC_2H_5
 CH_3

(d)
$$CH_3 - CH - C - OC_2H_5$$

 $CH_2 - C - OC_2H$

64.
$$CH_2$$
— CH_2 — $CC_2H_5 \xrightarrow{C_2H_5\overset{\ominus}{O}} (X) \xrightarrow{\overset{\oplus}{H_3O}} Y + Z$
 ΔA

Find final product 'A':

(a)
$$Ph$$
— CH_2 — C — CH — C — OC_2H_5
 Ph

(c)
$$Ph$$
— C — CH_2 — CH_2 — C — OH



65.
$$OCH_{3} \xrightarrow{OCH_{3}} \frac{CH_{3}O}{H^{\oplus}/H_{2}O} \xrightarrow{H^{\oplus}/H_{2}O} \xrightarrow{Ph-C-H, OH} X$$

Identify 'X':

66.
$$X \xrightarrow{C_2H_5O} \bigoplus_{H_3^{\oplus}O} C \longrightarrow C \longrightarrow C$$

Find correct structure of 'X':

(c)
$$CH_3$$
 O OCH₃

Identify name of reaction:

- (a) Aldol condensation
- (c) Crossed Claisen condensation
- (b) Cannizzaro condensation

(

(d) Tischenko reaction

68.
$$\begin{array}{c}
O \\
H-C \\
H-C \\
H-C
\end{array}$$

$$CH_2 \xrightarrow{C_2H_5O^{\ominus}} A + H_2C = CH-C-H \xrightarrow{H^{\oplus}/H_2O} B$$

Identify structure of final product B:

$$69. \qquad \xrightarrow{C_2H_5\overset{\Theta}{O}} X + CH_2 = CH - C = N \xrightarrow{H_3^{\oplus}O} Y$$

Identify final product 'Y':

(d) None of these

70.
$$A+B \xrightarrow{1. C_2H_5O} \xrightarrow{0} \xrightarrow{0}$$

Identify A and B:

71.
$$(Y)$$

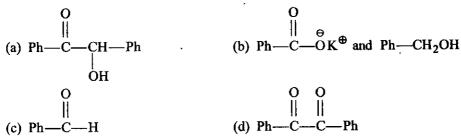
Find structure of X':

72. In the given reaction:

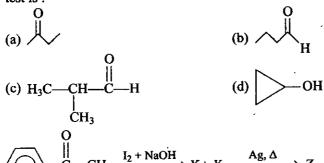
(a)
$$D_{2O} \rightarrow (P)$$
; (P) will be:

73. In the given reaction:

74.
$$(Y)$$
 (Y) will be :



- 75. Compound 'X' C₄H₈O which gives 2, 4-DNP derivative and negative iodoform test is:
 - (a) O(b) CH_2 —OH
 (c) O(d) O CH_3
- 76. Compound 'X' C₄H₈O which gives 2, 4-DNP derivative and positive iodoform test is:



77.
$$C \longrightarrow CH_3 \xrightarrow{I_2 + \text{NaOH}} X + Y \xrightarrow{\text{Ag, } \Delta} Z$$

Identify final product Z':
(a) CHI₃

(d) $H_2C = CH_2$

8.
$$(3.6)$$
 (3.6) $($

(a) OH OH (b) COOH

(b) COOK®

(c) COOK®

(d) COOK®

(d) CH₂OH

79. CH₂OH

79. CH₃
$$\frac{1_2 + \text{Ca}(\text{OH})_2}{\text{CH}_2\text{OH}} \xrightarrow{X + Y} \xrightarrow{\Delta} Z \xrightarrow{\text{CH}_3\text{MgBr}} A$$

Identify final product 'A':

(a) CHI₃
(b) Ph—C—Ph

(c) Ph—C—Ph

(d) CHO ©

(A) Ph

(e) Ph—CHO OH

(f) CHO ©

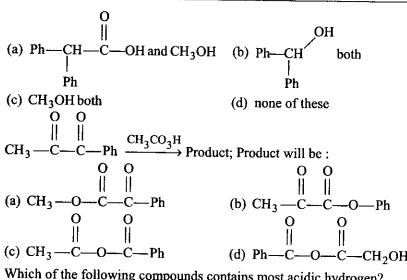
(h) OH

(h) CHO OH

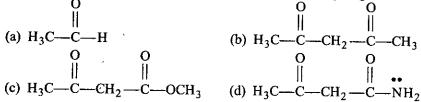
(h) CHO

Y and Z are respectively:

(a) 1



87. Which of the following compounds contains most acidic hydrogen?



88. Which hydrogen of the given compound is least acidic in nature?

89. Which hydrogen of above compound (Question no. 88) is most acidic? (a) 1 (b) 2 (c) 3 (d) 4

90. Compound (X) C_4 H_8 O gives positive haloform test but does not give 2, 4-DNP derivative is:

(a)
$$OH$$

OH

OH

OOH

OOH

Ph—C—C—Ph $NaOH$

Product, find structure of product:

COOH

92. In the given reaction sequence

$$\frac{\text{Br}_2}{\text{H}_2\text{O}} A \xrightarrow{1. \text{ OH}} B; (B) \text{ is :}$$

93.
$$\xrightarrow{\begin{array}{c} 1. \text{ Br}_2, \text{ H}_2\text{O} \\ \hline 2. \text{ OH} \\ 3. \text{ H}_3^{\oplus}\text{O} \end{array}}$$

Compound B is:



95.
$$\underbrace{\begin{array}{c} 1. \text{ NaOH} \\ 2. \text{ Ph--C--H} \end{array}}_{\text{O}} X \xrightarrow{\text{NH}_2 - \text{NH}_2/\text{OH}} Y$$

Compound (Y) is:

(d)
$$\sim$$
 CH₂—Pl

96.
$$CH_3$$
— CH_2 — C — CH_2 — $Br \xrightarrow{1. C_2H_5 \circ ONa^{\oplus}} (X)$

(X) will be:

(c) Mixture of (a) and (b)

97.
$$Me_2CuLi$$
 $H_3^{\oplus}O$ Product; Product will be:

98. In the given reaction

(a)
$$CH_3$$

$$\xrightarrow{1. \text{ NaH, THF}} (X); X \text{ will be}:$$

$$OH$$

$$O$$

$$O$$

$$O$$

$$O$$

$$O$$

$$O$$

$$O$$

$$O$$

$$O$$

99. Which of the following compounds would be most reactive for Perkin condensation with acetic anhydride?

(a)
$$O_2N$$
—C—H (b) CH_3O —C—H

(c) H_3C —C—H (d) CI —CHO

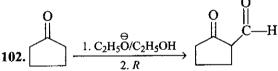
- 100. Cinnamic acid from benzaldehyde would be prepared by which of the following reactions?
 - (a) Perkin reaction

- (b) Reformatsky reaction
- (c) Knoevenagel condensation
- (d) All of these
- 101. The given conversion can be performed by which of the following reactions?

- (a) Aldol condensation
- (b) Michael addition

(c) Perkin reaction

(d) Reimer-Tiemann reaction



(R) would be:

(a) HCHO

(c) $(COOC_2H_5)_2$

Above conversion can be achieved by:

- (a) Wolff-Kishner reduction
- (b) Clemmensen reduction

(c) LiAlH₄

(d) NaBH₄

104. Predict the major product of reaction:

$$O \qquad CI \qquad O \qquad N_2H_4/KOH \qquad (A); \text{ Product } (A) \text{ is } :$$

$$NO_2$$

$$(a) \qquad O \qquad (b) \qquad O \qquad (c) \qquad O \qquad (d) \qquad O \qquad (d)$$

A + B; Compounds A and B can be differentiated by: 105.

- (a) 2, 4-DNP
- (c) Lucas reagent

(b) Fehling solution (d) NaHSO₃

- OCH_3 OH. 106. and

, these compounds can be differentiated by :

- (a) 2, 4-DNP
- (b) Tollen's reagent
- (c) Lucas reagent
- (d) NaHSO₃

$$(q) \qquad H$$

108.
$$Mg-Hg, \rightarrow X$$
; Find out final product (X) :



109. Ph
$$C - CH_3 \xrightarrow{M - CPBA} (X)$$
; find major product (X) :

(a) Ph
$$\begin{array}{c} H & O \\ \parallel \\ CH_3 \end{array}$$

(c) Ph
$$\begin{array}{c|c} CH_3 & O \\ \parallel & \parallel \\ C-O-CH_3 \end{array}$$

(d)
$$Ph \xrightarrow{CH_3} C - CH$$

111.
$$\xrightarrow{\text{H}_3O}$$
 Product:

112.
$$O$$
 LiAlH₄ \rightarrow Conc. H_2SO_4 \rightarrow (X); Product (X) of reaction is :

ΗO

(c) Ph—CH—CH—CH
$$_2$$
—OH

(d)
$$Ph$$
— CH = CH — CH_3

114.
$$0 00 0 \xrightarrow{\text{H}_3^{\text{m}}O} A + 2 \text{ Glycerol}$$

Product (A) of the reaction is:

115.
$$\xrightarrow{\text{H}_2\text{C} = \overset{\oplus}{\text{N}} = \overset{\ominus}{\text{N}}} X \xrightarrow{\text{CF}_3\text{CO}_3\text{H}} Y; \text{ Product 'Y' is :}$$

116.
$$O \xrightarrow{H_2N \longrightarrow OH} X \xrightarrow{PCl_5} Y$$
; Final product Y is:

117.
$$OEt \xrightarrow{HO OH (1 \text{ Mole})} \xrightarrow{2PhMgBr} \xrightarrow{H^{\oplus}_{3O}}$$

Find out final product of reaction:

$$(a) \qquad Ph \qquad (b) \qquad (b)$$

118.
$$O$$
 + CH₂=CH—CH₂—Br \xrightarrow{KOH} Major product (X)

(b)

Find out (X) of the reaction:

(a)
$$CH_2$$
— CH = CH_2

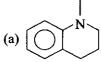
N-OH

$$\begin{array}{c} CH_2-CH=CH_2\\ O-CH_2-CH\\ \parallel\\ CH_2 \end{array}$$

119.
$$\frac{\text{Conc. H}_2\text{SO}_4}{\Delta} \rightarrow -$$

 CH_2 —CH= CH_2

'Y' will be: Η



$$(d) \bigcup^{H} OH$$

 \rightarrow (A); Product 'A' will be:

(d) none of these

121.
$$\stackrel{\text{O}}{\longrightarrow} \stackrel{\text{Nie}_2\text{CuLi}}{\longrightarrow} \text{Product}$$
:

122.
$$\bigcirc$$
 + \bigcirc C \bigcirc CI \bigcirc AlCl₃ \bigcirc (X); X will be:

(a) \bigcirc C+ (b) \bigcirc + (c) \bigcirc (d) \bigcirc C=

123. \bigcirc MeONa/MeOH \bigcirc (A); find out major product (A):

(a) \bigcirc (b) \bigcirc (d) \bigcirc Product:

(b) \bigcirc AcONa \bigcirc Product:

(a) \bigcirc Addol condensation

(b) \bigcirc , Aldol condensation

(c) \bigcirc Perkin condensation

(d) \bigcirc Product:

(a) \bigcirc Product:

(b) \bigcirc CH=CH—C—OH

(c) \bigcirc Claisen condensation

, Cannizzaro reaction



Reagents required for above conversion is:

(c) H^{\oplus} , OH/Δ (a) LiAlH₄, H^{\oplus}, Δ (b) OH/Δ , H^{\oplus} (d) NaBH₄, H[⊕]

126. Consider the following carbonyl compounds

Which of the following is correct decreasing order of their dipole moment?

(a)
$$P > R > Q > S$$
 (b) $S > R > Q > P$ (c) $S > Q > R > P$ (d) $Q > S > R > P$

O

127. G—CH₃ CH₂N₂, Δ CH₃—C—CH₂—G

Which of the following is correct decreasing rate of homologoation with various G?

(a)
$$-O Me > -CH_3 > -NO_2 > -H > -F$$

(b)
$$-NO_2 > -F > -H > -CH_3 > -OCH_3$$

(c)
$$-OMe > -CH_3 > -H > -F > -NO_2$$

(b)
$$-NO_2 > -F > -H > -CH_3 > -OCH_3$$

(c) $-OMe > -CH_3 > -H > -F > -NO_2$
(d) $-OMe > -NO_2 > -H > -F > -CH_2$

128. CH₃—C—H react most readily with:

(a)
$$H_2N-NH_2$$

(a) 2

(b)
$$H_2N-NH-C-NH_2$$

(c)
$$Ph-NH-NH_2$$

(d)
$$H_2N$$
—OH

129. The possible number of stereoisomers of the product of following reaction would be:

Ph—CH=CH—CH—C=O
$$\xrightarrow{\text{H}_2\text{N}-\text{OH}}$$
+

CH₃ H

(b) 6 (c) 8 (d) 4

130. The final product (C) of the following reaction would be:

$$C_6H_5 \longrightarrow C_6H_5 \xrightarrow{H_2N \longrightarrow OH} A \xrightarrow{PCl_5} B \xrightarrow{Br_2/Fe} C+$$

(c)
$$\xrightarrow{\text{CH}_3\text{OH (excess)}} \xrightarrow{\text{Mg/ether}} \xrightarrow{\text{O}} \xrightarrow{\text{H}_2\text{O/H}_3^{\oplus}\text{O}}$$

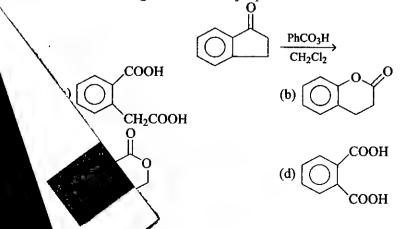
$$(d) \xrightarrow{\text{H}_2\text{O}/\text{H}_3^{\oplus}\text{O}} \xrightarrow{\text{CH}_3\text{OH (excess)}} \xrightarrow{\text{Mg/ether}} \xrightarrow{\text{O}}$$

132.
$$S \xrightarrow{\Theta \oplus BuLi} P \xrightarrow{R-X} Q \xrightarrow{BuLi} R \xrightarrow{R''-X} S \xrightarrow{HgCl_2} T$$

The final product 'T' is:

(a) (b)
$$S$$
 (c) S (d) R' C R'

133. In the following reaction the major product formed is:



134.
$$+ H_3C - C - CH_3 \xrightarrow{C_2H_5O} X'$$
; 'X' is:

Which of the following reagents is suitable for above conversion?

(a) Zn-Hg/HCi

(b) LiAlH₄

(c)
$$H_2N-NH_2/OH$$

136.
$$\stackrel{\overset{\circ}{\longrightarrow}}{\longrightarrow}$$
 Product :

(d)
$$Ph \longrightarrow C \longrightarrow O + CH_2Br_2$$

137.
$$H_2N$$

$$\downarrow O$$

(a)
$$H_2N$$
 OH

(d)
$$H_2N$$
 O

138.
$$\rightarrow$$
 O $\xrightarrow{HCN} \xrightarrow{H_3^{\oplus}O} \xrightarrow{H_2SO_4} \xrightarrow{B_2H_6} \xrightarrow{\Theta} \text{Product}:$

(a) HO \xrightarrow{O} OH OH

OH

OH

OH

OH

Which of the following sets of reagents is the most appropriate to perform the above conversion?

- (a) HIO₄; OH; Zn-Hg/HCl
- (b) Cold KMnO₄; Pb (OAc)₄; OH; Li/NH₃
- (c) O₃/Me₂S; OH; Li/NH₃
- (d) KMnO₄; OH/Δ ; N_2H_4/OH , Δ

140. Reactant
$$\xrightarrow{OH}$$
 CH_3 CH_3

The suitable reactant is:

(a)
$$\longrightarrow$$
 O \longrightarrow CH₃ \longrightarrow CH₃
(b) CH₃ \longrightarrow CH₃
(c) \longrightarrow H

Al(OCMe₃)₃
 \longrightarrow O \longrightarrow H

The above reaction is known as:

- (a) Kolbe reaction
- (c) MPV reductions

- (b) Oppenauer oxidation
- (d) Tischenko reaction

142. The product formed in the reaction is:

O
$$\longrightarrow$$
 C \longrightarrow C \longrightarrow

143. Which of the following reactants on reaction with conc. NaOH followed by acidification gives the following lactone as the only product?

145.
$$(a)$$

NH₂

Raney Ni

Product

(b)

N

N

N

N

N

H

H

H

146. The structure of major product of following reaction is:

(a)
$$H$$
 (b) C_2H_5O/C_2H_5OH (c) H (d) H

147. Which of these pair of reactants compound may be used to make this given acetal?

148. Identify the major product of following reaction:

$$Br \xrightarrow{2 \text{ NaOH}} \\ alcoholic \\ (c) C (d) Br$$

149. Find the major product of reaction:

150. Which of the following is major product of reaction?

151. What would be the major product of following reaction?

OH
OH
OH
CH—
$$C_6H_5$$
OH
OH
OH
OH
OH
OCH—Ph
OCH—Ph
OH
OCH
OH
OH
OH
OH
OH

152. What dicarbonyl compound is needed to prepare the following compound by aldol reaction?

(a) (b) (c) (d) Cannot be prepared

153.
$$O$$
 (a) (d) Cannot be prepared

(a) (b) (c) (d) No reaction

(b) (d) No reaction

OH

154. O (d) No reaction

OH

(c) O (d) Cannot be prepared

(d) No reaction

OH

(e) O (f) O (f)

H₃CC

٠,

159.
$$C_{2}H_{5}\overset{\ominus}{O} \xrightarrow{C_{2}H_{5}\overset{\ominus}{O}} \xrightarrow{CH_{3}I} \xrightarrow{Br_{2}} \xrightarrow{(CH_{3})_{3}C-\overset{\ominus}{O}K} \xrightarrow{Product} :$$

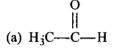
(a) $C_{1}H_{2}$
(b) $C_{1}H_{2}H_{2}\overset{\ominus}{O} \xrightarrow{CH_{3}COOH} \xrightarrow{C$

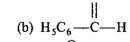
EXERCISE-2 MORE THAN ONE CORRECT ANSWERS

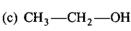
- 1. Which of the following do not react with Fehling solution?
 - (a) CH₃CHO
- (b) Ph—CHO
- (c) Glucose

 C_6H_5

- (d) | |
- 2. Which of the following form Schiff's base with CH₃—NH₂?









- 3. H—C—OH and H₃C—C—OH can be distinguished by:
 - (a) NaHCO₃

(b) H_2SO_4

(c) AgNO₃/NH₄OH

- (d) Fehling solution
- 4. H₃C—C—H and C—C—H can be distinguished by:
 - (a) Tollen's reagent

(b) Fehling solution

(c) Benedict solution

- (d) H₂N---OH
- 5. Which of the following give N-substituted amide from ketoxime?
 - (a) PCl₅
- (b) SO₃
- (c) BF₃
- (d) NH₃

- 6. Acetaldehyde can be obtained from which of the following reactions?
 - (a) $CH_3CH_2OH \xrightarrow{Cu/\Delta}$

(b)
$$CH_3$$
— C — $CI \xrightarrow{Pd-BaSO_4}$

(c)
$$(CH_3COO)_2Ca + (HCOO)_2Ca \xrightarrow{\Delta}$$

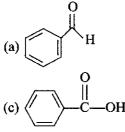
(d)
$$H_3C$$
— CH = C — Ph $\xrightarrow{O_3}$ $Zn-H_2O$ CH_3

7. Which of the following do not give Cannizzaro reaction?

$$(d) \begin{array}{c} Me \\ N \end{array} \begin{array}{c} O \\ \parallel \\ C - H \end{array}$$

8. Which of the following yield yellow precipitate on reaction with I₂ and NaOH?

9. Which of the following compounds exhibit acid base reaction with NaOH?







10.
$$CH_2$$
 CH_2 CH_2

In the reaction X and Y may be:

- (a) pcc and Ph₃P=CH₂
- (b) PDC and Ph₃P=CH₂
- (c) pcc and Ph_3P —CH— CH_3
- (d) pcc and $Me_2S = CH_2$
- 11. The synthesis of Ph—C—OH can be achieved by:

CH₃

(a) PhMgBr +CH₃ —C—C₂H₅
$$\xrightarrow{H^{\oplus}/H_2O}$$

(b)
$$C_2H_5MgBr + Ph - C - CH_3 \xrightarrow{H^{\oplus}/H_2O}$$

(c)
$$CH_3MgBr + Ph$$
— C — CH_2CH_3 $\xrightarrow{H^{\oplus}/H_2O}$

(d) PhMgBr + CH₃ — C — Cl
$$\xrightarrow{H^{\oplus}/H_2O}$$

12. Which of the following are correct for reaction?

$$CH_3 \xrightarrow{Br_2 + NaOH} A + B \xrightarrow{H^{\oplus}} C + CO_2$$

$$COO^{\oplus}Na^{\oplus}$$

(a)
$$A$$
 is $Br \rightarrow Br$

(b)
$$B$$
 is

13.
$$CH_3$$
 CH_3 CH_2 CH_3 COH_3 $COH_$

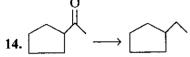
Select the reactions involved in the above reaction:

(a) Michael Addition

(b) Aldol Condensation

(c) Dehydration

(d) Perkin Condensation



Which of the following reagents can perform this conversion successfully?

- (a) HS SH, H₂ and Ni
- (b) Zn-Hg/HCl

(c) Mg.THF/H₂O

- (d) N_2H_4/OH
- 15. Select the correct combination:

(a)
$$H_3C$$
— C — H \xrightarrow{O} H_3C — CH = CH — C — H

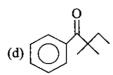
(b) Ph—C—H
$$\stackrel{\text{KOH}}{\longrightarrow}$$
 Ph—C—OK[©] +Ph—CH₂—OH

(c) Ph—C—H
$$\xrightarrow{\text{Al }(\text{OEt})_3}$$
 Ph—C—O—CH₂—Ph

$$(d) H \xrightarrow{NaOH} H \xrightarrow{H} C \xrightarrow{OH} + CH_3OH$$

16.
$$CMe_3 \xrightarrow{CH_2N_2, \Delta} Products$$

The possible products are:



17. Which of the following reactions involve hydride ion transfer?

(a)
$$2H$$
— C — H $\xrightarrow{\Theta}$ H — C — O + CH_3 — OH

- 18. Which of the following statements are correct?
 - (a) Carbonyl compounds give nucleophilic addition reaction while alkenes give electrophilic addition reaction
 - (b) C=0 bond has larger dipole than C=C
 - (c) Aldehyde and terminal alkyne both react with Tollen's reagent
 - (d) Aldehydes and ketones can be distinguished by 2, 4-DNP
- 19. Which of the following may be classified as an acetal?

(a)
$$\begin{pmatrix} 0 \\ 0 \end{pmatrix}$$
 (b) $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$

(c)
$$\bigcirc$$
 OCH₃ (d) \bigcirc O

20. Which of the following pairs are not correctly matched?

(a)
$$C=O \xrightarrow{\text{Zn-Hg}} CH_2$$

(a)
$$C=O \xrightarrow{Zn-Hg} CH_2$$
 (b) $C=O \xrightarrow{N_2H_4/OH} CH-OH$

(c)
$$C = O \xrightarrow{H_2, Pd-BaSO_4} C = O (d) - C = N \xrightarrow{Sn + HCl} C - NH_2$$

21. Which of the following compounds will not show enolisation?

22. Which compounds will be oxidised by HIO₄?

23. Which of the following reactions can produce benzaldehyde as major product?

(a)
$$CH_3$$
 $C=CH-Ph$
 $C=CH-Ph$
 CH_2-OH
 $CH_$

24. The suitable reagents for the following reaction are:

$$\begin{array}{ccc}
O & & NH_2 \\
& & & \\
CH_3 & & CH_3
\end{array}$$

(a)
$$\xrightarrow{PCl_5} \xrightarrow{NaOH} \xrightarrow{\Delta} \xrightarrow{H^{\oplus}} \xrightarrow{NH_3} \xrightarrow{Br_2 + KOH} \xrightarrow{NH_3} \xrightarrow{Br_2 + KOH}$$

(c)
$$\xrightarrow{\text{NH}_2\text{OH}} \xrightarrow{\text{PCl}_5} \xrightarrow{\text{dil. NaOH}} \xrightarrow{\text{N}_3\text{H}} \xrightarrow{\Delta}$$

(d)
$$\xrightarrow{\text{H}_2\text{N}--\text{OH}} \xrightarrow{\Delta}$$

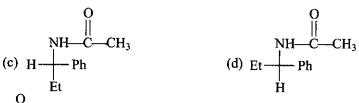
25. Which of these carbonyl compounds on reduction with Zn-Hg/HCl will give the same product?

(a)
$$H = C$$
 $CH_2 = CH$
 CH_3

(b) $H_3C = CH$
 CH_3
 CH_3

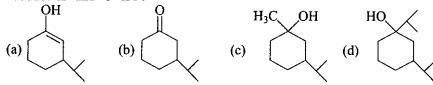
26. H
$$\xrightarrow{\text{COOH}}$$
 $\xrightarrow{\text{1. PCl}_5}$ $\xrightarrow{\text{1. PCl}_5}$ $X \xrightarrow{\text{H}_2\text{N} \longrightarrow \text{OH}}$ $Y \xrightarrow{\text{H}_2\text{SO}_4}$ $Z \xrightarrow{\text{Et}}$ $X, Y \text{ and } Z \text{ are :}$

$$\begin{array}{ccc} & & & \text{OH} \\ & & & \text{C=N} \\ \text{(b)} & & \text{H} & & \text{Ph} \\ & & & \text{Et} \end{array}$$



27.
$$\longrightarrow$$
 MgBr $\xrightarrow{\text{H}_3^{\oplus}\text{O}} A \xrightarrow{\text{H}_3\text{CMgBr}} B \xrightarrow{\text{H}_3^{\oplus}\text{O}} C$

Product 'A' and 'C' are:



- 28. Which of the following alcohols can be oxidised by K₂Cr₂O₇?
 - (a) CH₃—CH₂—OH

(c) > OH

(d) $H_2C = CH - CH_2 - OH$

- (a) $I_2 + NaOH$
- (b) NaSO₃H (c) NaCN/HCl (d) 2, 4-DNP
- 30. Which of the following reactions will produce aldehyde?

(a)
$$\rightarrow \frac{O_3}{Z_{n-H_2O}}$$

(b)
$$H_3C$$
— CH = $CH_2 \xrightarrow{CO + H_2} \xrightarrow{CO_2(CO)_8}$

(a)
$$\longrightarrow$$
 \longrightarrow (b) H_3C — CH = CH_2 $\xrightarrow{CO + H_2}$ $\xrightarrow{CO_2(CO)_8}$ (c) H_3C — C = CH $\xrightarrow{B_2H_6}$ (d) H_3C — C = CH $\xrightarrow{Hg^{+2}, H_2SO_4}$

$$(d) H3C - C = CH \xrightarrow{Hg^{-2}, H2SO4}$$

31. In the given reaction:

$$Ph \xrightarrow{C} CH_3 \xrightarrow{H_2N \longrightarrow OH} (X) \xrightarrow{PCl_5} (Y)$$

Y will be:

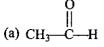
(d) Ph—CH₂—CN

- 32. Fehling solution gives red precipitate with:
 - (a) Aromatic aldehyde

(b) Aliphatic aldehyde

(c) Ketone

- (d) α-Hydroxy ketones
- 33. Which of the following compounds will give positive Tollen's test?



- (d) H₃C—CH OCI
- 34. Silver mirror test with Tollen's reagent is given by:

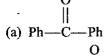
35.
$$A \xrightarrow{1. \text{ Ph}_3 \text{P}} \text{CH} \longrightarrow \text{CH} \longrightarrow \text{CH}$$

In the above reaction A and B will respectively be:

(c)
$$\longrightarrow$$
 Br and H_3C — C — F

Br and
$$H_3C$$
— C — H (d) H_3C — CH_2 —Br and C

- 36. Mixture of Ph—C—H and HCHO is treated with NaOH, then Cannizzaro reaction involves:
 - (a) Reduction of HCHO
- (b) Oxidation of HCHO
- (c) Reduction of PhCHO
- (d) Oxidation of PhCHO
- 37. Which of the following form stable hemiketal?

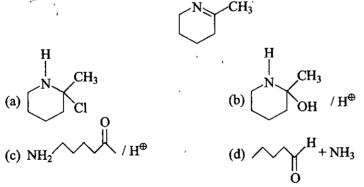


- 38. Among the following compounds which will react with acetone to give a product containing >C=N-?
 - (a) $C_6H_5NH_2$ (c) Ph-N-Ph

- (b) (CH₃)₃N (d) Ph—N—NH₂
- 39. A new C—C bond formation is possible in:
 - (a) Aldol condensation

- (b) Friedel-Crafts alkylation
- (c) Clemmensen reduction
- (d) Reimer-Tiemann reaction
- 40. Which of the following will undergo aldol condensation?

- (b) \(\sum_{\text{O}} \)
- (c) C-H (d) D_3C-C-H
- 41. Which of the following will not react with H₂O?
 - (a) CHCl₃
- (b) Cl₃C—CHO
- (c) CCl₄
- (d) Cl Cl
- 42. Grignard reagents produce carbonyl compounds with:
 - (a) CO₂
- (b) $R C \equiv N$
- (c) R—C—Cl
- (d) R—C—O—R
- 43. The given imine can be prepared from which of the following reactions?



44. Which of the following reactions would give identical product?

(a)
$$CH_3$$
— C — H
 HS
 H^{\oplus}
 H^{\oplus}
 H^{\oplus}
 CH_3 — C
 H^{\oplus}
 CH_3 — C
 H^{\oplus}
 CH_3 — C
 H^{\oplus}
 CH_3 — C
 CH_3 — C
 H^{\oplus}
 CH_3 — C
 CH_3 — C

(c)
$$CH_3$$
 $C=CH-CH_3$ O_sO_4 HIO_4 CI CI CI $CH_3-CH-CH_3$ O_sO_4 O_5

Identify the reagents that can perform this conversion successfully:

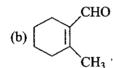
(a) H₂, Raney Ni, Δ

(b) Mg.THF, H₂O

(c) NaBH₄, H₂O

- || (d) H—C—H, O^ΘH
- **46.** Which of the following compounds can be synthesized by intramolecular aldol condensation in very good yield?





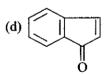


47. Identify the compounds that give aromatic salt on reaction with HClO₄:



(b) (b)





- 48. Which of the following pairs can be differentiated by Tollen's reagent?
 - (a) OH OH CH—CH—CH—CH
 - (b) \bigwedge_{O}^{H} and \bigwedge_{O}^{A}
 - (c) OH O
 - (d) \bigwedge^{H} and \bigwedge^{O}

49. When salicyl aldehyde is treated with (CH₃CO)₂O in presence of CH₃COO^ΘNa[⊕], Δ:

- (d) This reaction is Perkin condensation.
- 50. Which of the following compounds will react faster than CH₃—C— with CH₃MgBr?

EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

The addition reaction of enol or enolate to the carbonyl function of aldehyde or ketone is known as aldol addition. The β -hydroxyaldehyde or β -hydroxyketone so obtained undergo dehydration in second step to produce a conjugated enone. The first part of reaction is an addition reaction and the second part is an elimination reaction. Carbonyl compound having α -hydrogen undergoes aldol condensation reaction.

$$2CH_{3}CH_{2} \xrightarrow{C} -H \xrightarrow{\Theta_{OH}} CH_{3}CH_{2}CH = C -C -H$$

$$CH_{3}$$



Mechanism:

1. Find out product of following reaction:

$$\begin{array}{c|c}
C & \xrightarrow{\text{NaOH}} X
\end{array}$$

X is:

(a)
$$CH_3$$
— CH = CH — C — Ph

(b) Ph — C = C

Ph

Ph

(c) Ph — C — CH = C — CH_3

Ph

(d) None of these

2. Which of the following will give aldol condensation?

3. Find out major product of following reaction:

$$\begin{array}{c|c}
 & H & O \\
 & C = O \\
 & C = O
\end{array}$$

Passage-2

The base catalysed reaction of 1, 2-diketone to a salt of 2-hydroxy carboxylic acid is known as benzilic acid rearrangement. The reaction is not applicable to 1, 2-diketones containing α -methylene group because of competing aldol condensation.

4. Find out product of following reaction:

5.
$$O_2N$$

CH₃

OH O

CH₃

(a)
$$OH$$
 $COOH$ (b) OH $COOH$ OH $COOH$

Passage-3

When an aldehyde with no α -hydrogen react with concentrated aqueous NaOH, half the aldehyde is converted to carboxylic acid salt and other half is converted to an alcohol. In other words, half the reaction is oxidized and other half is reduced. This reaction is known as Cannizzaro reaction.

Mechanism:

7. Which of the following will not give Cannizzaro reaction?

8. Find out the products of following reaction:

$$\begin{array}{c|cccc}
O & O \\
\parallel & \parallel & KOH \\
C - H & + H - C - H & KOH \\
\end{array}
X + Y$$

X and Y are:

9. Find out 'X' of the reaction:

(a) Ph—CH—C
$$_{0}^{\ominus}$$
 (b) Ph—CH—CH $_{2}^{\ominus}$ OH
(c) Ph—C—CH $_{2}^{\ominus}$ OH
(d) Ph—CH—CH $_{2}^{\ominus}$ OH

Passage-4

When two molecules of an ester undergo a condensation reaction, the reaction is called a Claisen condensation. The product of a Claisen condensation is β -ketoester.

$$\begin{array}{c|cccc}
O & O & O \\
\parallel & \parallel & \parallel \\
2CH_3CH_2 - C - OEt & & CH_3CH_2 - C - CH - C - OEt + EtOH \\
& & CH_3
\end{array}$$

Mechanism:

$$CH_{3}-CH-C-OEt \xrightarrow{EtO} CH_{3}-CH-C-OEt \xrightarrow{CH_{3}CH_{2}-C-OEt} CH_{3}-CH-C-OEt \xrightarrow{EtOH} CH_{3}-CH-C-CH_{2}CH_{3}+EtO$$

$$CH_{3}-CH-C-OEt \xrightarrow{EtOH} CH_{3}-CH-C-CH_{2}CH_{3}+EtO$$

$$CH_{2}CH_{3}-CH-C-CH_{2}CH_{3}+EtO$$

10. Find out product of following reaction:

(c)
$$Ph$$
— CH_2 — C — CH — C — OH (d) None of these Ph

11. Find out final product of reaction:

$$H_3CO$$

$$OCH_3 \xrightarrow{CH_3O} X \xrightarrow{1. H^{\oplus}/H_2O} Y$$

12. Find out starting materials for following β -ketoester:

$$X + Y \xrightarrow{1. \text{ CH}_3\text{CH}_2\text{O}} \bigcirc \bigcirc \bigcirc \bigcirc$$

X' and Y' are:

Passage-5

An organic compound A has molecular formula $C_{11}H_{14}O$. A on treatment with H_2N —OH yields two stereoisomer B and C having molecular formula $C_{11}H_{15}NO$. B and C on treatment with concentrated H_2SO_4 yield D and E. D and E are respective isomer of B and C. D on alkaline hydrolysis produces optically active amine F ($C_4H_{11}N$). E on alkaline hydrolysis produces aniline as one product.

13. Find out structure of organic compound A:

14. Compounds B and D are:

- (a) Functional isomer
- (c) Geometrical isomer
- (b) Enantiomer(d) Metamers
- (a)
- 15. Compounds D and E are :
 - (a) Functional isomer(c) Geometrical isomer
- (b) Enantiomer(d) Metamers

Passage-6

C=CH—Ph
$$\xrightarrow{O_3}$$
 $A+B$

Ca(OH)₂+I₂
 $C+D$
 Δ
 $E+CaCO_3$

16. $A + B \xrightarrow{\text{NaOH}} \text{Product}$:

17. Find correct structure of E:

(a)
$$\begin{bmatrix} \bigcirc & O \\ \parallel & C - O \end{bmatrix}_2$$
 Ca (b) $\begin{bmatrix} \bigcirc & O \\ \parallel & C - Pl \end{bmatrix}$

18. $E \xrightarrow{\text{CF}_3\text{CO}_3\text{H}} \text{Product}$:

(d) None of these

(d) None of these

Passage-7

Compound having —C—CH₃ group reacts rapidly with halogen in presence of a base to form haloform. The reaction is known as haloform.

$$\begin{array}{ccccc}
O & & & O \\
\parallel & & X_2 + OH & \parallel & \oplus \\
R - C - CH_3 & \longrightarrow & R - C - O + CHX_3
\end{array}$$

Mechanism:

$$R = C \xrightarrow{\text{CH}_2 - \text{H} + \text{OH}} \xrightarrow{\text{Slow}} R \xrightarrow{\text{Slow}} R \xrightarrow{\text{C} - \text{CH}_2 + X} X \xrightarrow{\text{N}} R \xrightarrow{\text{C} - \text{CH}_2 - X} \xrightarrow{\text{OH}/X_2}$$

$$R = C \xrightarrow{\text{C} - \text{CH}_2 - \text{H} + \text{OH}} \xrightarrow{\text{Slow}} R \xrightarrow{\text{C} - \text{CH}_2 + X} X \xrightarrow{\text{N}} R \xrightarrow{\text{C} - \text{CH}_2 - X} \xrightarrow{\text{OH}/X_2}$$

$$R = C \xrightarrow{\text{C} - \text{CH}_2 - \text{H} + \text{OH}} \xrightarrow{\text{Slow}} R \xrightarrow{\text{C} - \text{CX}_3} \xrightarrow{\text{OH}/X_2}$$

$$Q \xrightarrow{\text{OH}/X_2} \xrightarrow{\text{OH}/X_2} \xrightarrow{\text{OH}/X_2}$$

$$Q \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}} R \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}} R \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2}$$

$$Q \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}} R \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2}$$

$$Q \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2} \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2}$$

$$Q \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2} \xrightarrow{\text{C} - \text{CX}_3 + \text{OH}/X_2}$$

19. Which of the following will yield iodoform on reaction with I_2 + NaOH?

CMe₃

$$C - CH_3$$

$$C - CH_2$$

$$C - CH_3$$

Which of the following is correct comparison of rate of haloform reaction with various halogens?

(a)
$$r_{\text{Cl}_2} > r_{\text{Br}_2} > r_{\text{l}_2}$$

(b)
$$r_{I_2} > r_{Br_2} > r_{Cl_2}$$

(c)
$$r_{\text{Cl}_2} = r_{\text{Br}_2} = r_{\text{I}_2}$$

(d)
$$r_{\text{Br}_2} > r_{\text{Cl}_2} > r_{\text{I}_2}$$

21. Consider the following reactions:

Which of the following is correct comparison of the rate of reaction I and II:

- (a) $r_{\rm I} > r_{\rm II}$
- (c) $r_{\rm I} = r_{\rm II}$

- (b) $r_{\rm I} < r_{\rm II}$
- (d) Cannot be determined

Passage-8

$$\underbrace{\frac{\text{Br}_2 \text{ (1 Mole)}}{\text{hv}} X \xrightarrow{\text{alc KOH}} Y \xrightarrow{\text{Major)}} \frac{\text{O}_3}{\text{Me}_2 \text{S}} Z \xrightarrow{\text{NaOH, } \Delta} P}_{\text{Adom}}$$

22. Identify correct structure of 'Y':

23. Find out structure of final product P:



24. $Y \xrightarrow{BD_3 \cdot THF} Product$

Find out structure of product:

Passage-9

An organic compound (A) $C_8H_{10}O$ was subjected to a series of test in laboratory. It was found that this compound:

- (i) Rotates the plane polarized light.
- (ii) Evolves H2 gas with Na.
- (iii) Reacts with I2 and NaOH to produce yellow ppt.
- (iv) Does not react with Br₂/CCl₄
- (v) Reacts with hot KMnO₄ to form (B)C₇H₆O₂, which can also be synthesized by benzene and carbonyl chloride followed by hydrolysis.
- (vi) Loses optical activity as a result of reduction with Red P + HI to form 'C'.
- (vii) Reacts with Lucas reagent in about 5 minutes.

25. Find out structure of compound 'A':

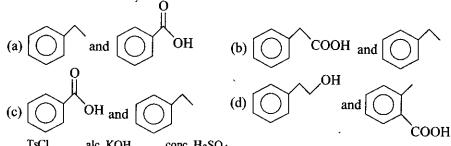
$$(a) \bigcirc OH \bigcirc OH \bigcirc O$$

$$(b) \bigcirc OH \bigcirc OH$$

$$(c) \bigcirc OH$$

$$CH_3^{\cdot}$$

26. Compounds B and C are respectively:



27.
$$A \xrightarrow{\text{TsCl}} X \xrightarrow{\text{alc. KOH}} Y \xrightarrow{\text{conc. H}_2\text{SO}_4} Z$$

Find out correct structure of Z.

(a)
$$(b)$$
 (c) (d) (d)

Passage-10

The base catalysed addition of a compound having active methylene group (or relatively acidic hydrogen) to activate alkene is known as Michael addition reaction.

Ph—CH=CH—C—OEt +
$$H_2$$
C(COOEt)₂ $\xrightarrow{C_2H_5 \text{ ONa}^{\oplus}}$ O
$$\downarrow \text{Ph—CH—CH}_2\text{—CC—OEt}$$

$$\downarrow \text{CH(COOEt)}_2$$

Mechanism:

$$C_2H_5O$$
 + H—CH(COOEt)₂ \Longrightarrow CH(COOEt)₂ + C_2H_5OH

28. Find out product of following reaction:

$$H_3C$$
— CH = CH — $NO_2 + H_2C$
 CHO
 $C_2H_5O^{\ominus}$
Product:

(a)
$$H_3C$$
— CH — CH_2 — C — H
 $CH(NO_2)_2$

(a)
$$H_3C$$
— CH — CH_2 — C — H
(b) H_3C — CH — CH_2 — C — H
 $CH(NO_2)_2$
 $CH(CHO)_2$

$$\begin{array}{c} \text{CH}_{3}\text{C} - \text{CH}_{2} - \text{CH}_{2} \\ \text{CH}_{2} - \text{C} - \text{H} \\ \parallel \\ \text{O} \end{array}$$

(d) None of these

29.
$$+ H_2C(COOEt)_2 \xrightarrow{EtO^{\ominus}} Product:$$

(a) Ph

Ph

Ph

Ph

EtOOC COOEt

O

(d) None of these

30.
$$C_2H_5O$$
 Product



Passage 11

An organic compound (A), C_7H_6Q gives positive test with Tollen's reagent, on treatment with alcoholic CN, (A) yields the compound (B), $C_{14}H_{12}O_2$. Compound (B) on reduction with Zn-Hg, HCl and dehydration gives an unsaturated compound (C), which adds one mole of Br_2/CCl_4 . The compound (B) can oxidized with HNO₃ to a compound (D), $C_{14}H_{10}O_2$. Compound (D) on heating with KOH undergoes rearrangement and subsequent acidification of rearranged products yields an acidic compound (E), $C_{14}H_{12}O_3$.

- 31. Compound (A) cannot undergo:
 - (a) Benzoin condensation
 - (c) Aldol condensation
- **32.** Structure of compound (B) is:

(a)
$$C - C - C$$

- (b) Cannizzaro reaction
- (d) Perkin condensation

33. Structure of compound
$$(E)$$
 is : OH

EXERCISE-4: MATRIX MATCH TYPE



1. Column (I)

2. Column (I)

Column (II)

P. Positive Fehling solution test

- Q. Form highly stable hydrate
- R. Turns 2, 4-dinitrophenyl hydrazine test
- S. Positive Tollen's test

 Column (II)
- P. No geometrical isomer on treatment with H_2N —OH, H^{\oplus}
- Q. Racemisation on treatment with aqueous H^{\oplus}/OH
- R. Michael addition with

 H₂C(COOEt)₂, Et O
- S. Condensation with Ph—C—H, OH

3. Column (I)

Column (II)

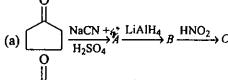
Q. Tautomerism

R. AgNO₃/NH₄OH

S. 2, 4-DNP test

4. Column (I)

Column (II)



- (b) $H_2N \longrightarrow H_2SO_4 \xrightarrow{H_2SO_4} B \xrightarrow{LiAlH_4} C$
- P. Formation of six member ring takes place
- Q. Final product is ketone
- (c) \xrightarrow{O} \xrightarrow{O} \xrightarrow{OH} Product

 (d) \xrightarrow{Ph} $\xrightarrow{H^{\oplus}, \Delta}$ Product
- R. Final product will give positive Tollen's test
- S. Final product will react with 2, 4-DNP

5. Column (I)

(a) Ph—C—H alkaline KCN Produc

Column (II)

- P. Final product forms positive Tollen's test
- (b) $O \xrightarrow{1.0H} Product$
- Q. Final product gives test with 2, 4-DNP

(c)
$$H_3C$$
— C — $OEt \xrightarrow{1. EtONa^{\oplus}} Product$

$$\begin{array}{c} C & \xrightarrow{3. \Delta} \end{array}$$

 R. Final product reacts with NaHCO₃ and liberated CO₂ gas

(d) Ph—C—H
$$\xrightarrow{1. \text{ KOH}}$$
 Product

S. Final product reacts with Na and liberated H₂ gas.

6. Column (I)

7. Column (I)

(a)
$$C = 0$$

8. Column (I)

(a)
$$2 \stackrel{O}{\longleftarrow} \stackrel{\Theta}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{O}{\longleftarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{H}{\longrightarrow} \stackrel{O}{\longrightarrow} \stackrel{O}{\longrightarrow$$

(b)
$$2_{H} \xrightarrow{O}_{H} \xrightarrow{O}_{CH_3} -OH + H \xrightarrow{O}_{O}$$

(c)
$$2Ph$$
—C—H \xrightarrow{KCN} Product

(d)
$$\stackrel{O}{\longrightarrow} \stackrel{\Theta}{\xrightarrow{I_2 + OH}}$$
 Product

Column (II)

- P. Aldol condensation
- Q. Cannizzaro reaction
- R. Benzoin condensation
- S. Claisen-Schmidt reaction

 Column (II)
- P. Positive Iodoform test
- Q. Reduces Fehling solution
- R. Positive Tollen's test
- S. Brady's reagent turns red

Column (II)

- P. Oxidation
- Q. Condensation
- R. Nucleophilic addition
- S. Electrophilic substitution
- T. Nucleophilic substitution

9. Column (I)

$$(a) \qquad Me \qquad Me \qquad CH_2OH$$

Column (II)

$$(b) \xrightarrow{\text{Me}} O CHO$$

$$(c) \xrightarrow{\text{OH}} O H$$

Q. MnO₂

(d)
$$H_3C$$
— CH = CH_2 \longrightarrow C — CH = CH_2 $S. SeO_2$

10. Column (I)

Column II

- P. Fehling solution
 - Q. 2,4-dintrophenyl hydrazine test

(b) H₃C—C—CH₃

O
||
(c) H—C—H

O
||
C—H

R. Tollen's reagent

(d) OH

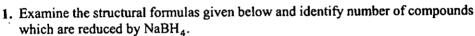
S. Iodoform test

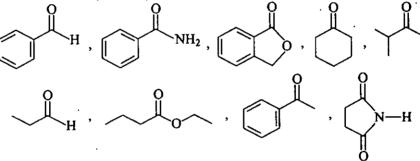
11. Column (I)

Column II

P. Perkin condensation

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS





2. Find out number of substrates those cannot undergo Cannizzaro's reaction.

3. Examine the structural formulas of compounds given below and identify number of compounds which show positive iodoform test.

4. Find out number of products obtained by cross Cannizzaro's reaction between

Of the following compounds, how many would give positive test with Tollen's reagent.

6. Of the following carbonyl compounds, how many would give aidol condensation reaction.

Consider the following reactions and identify how many reactions can give carbonyl compounds as major product.

8. Consider the following reactions, and find out number of reactions which are Claisen condensation in nature.

(a) 2 OC₂H₅
$$C_2$$
H₅ O
(b) 2 C CH₃ O
(c) Ph OC₂H₅ C_2 H₅ O
(d) 2H C H O
(e) O + H C OC₂H₅ C_2 H₅ O
(f) C OC₂H₅ C_2 H₅ O
(h) O O
(h) O O
(c) Ph OOC₂H₅ O
(d) 2H C H O
(e) O + H C OC₂H₅ O
(f) O O
(g) O O
(h) O

9. Examine the structural formulas of following compounds and find out number of compounds which show higher rate of nucleophilic addition

$$H_3C$$
 C
 C
 H
 O
 H
 O

Identify numbers of reagent that can be used for above conversion.

(d)
$$N_2H_4$$
 / $\overset{\Theta}{O}H$

(e)
$$\begin{array}{c} \text{CH}_2 - \text{SH} \\ \downarrow \\ \text{CH}_2 - \text{SH} \end{array}$$
, H_2 / Ni (f) SeO_2

'AL

TANSWERS



Exercise-1: Only One Correct Answer

										, .,					w we to be
2 . (b)	3.	(b)	4.	(b)) 5	. (d)	6.	(b)	7.	(d)	. 8.	(d)	9.	(c)	10. (d
12. (d	13.	(a)	14.	(b) 15	. (b)	16.	(b)	17.	(c)					20. (c)
22. (d)	23.	(d)	24.	(a)	25	. (b)	26.	(d)	27.	(d)				(d)	30. (d)
														(a)	40 (d)
42. (b)	43.	(b)	44.	(a)	45	(b)	46.	(a,d)	47	(b)	48.	(a,b) 49,		
															•
2. (b)	_ .	~ - (a)	4.	(a'		(b)	- 6.	(a)	7	(4)	8	(b)	9	(c)	10. (c)
٠.															20. (b)
									·~.					• •	30. (c)
														\-,	40 (d)
														` .	50. (d)
															60. (b)
										٠.				• •	70. (b)
														. ,	80 (c)
														` •	90. (a)
															100. (a)
															110. (a)
															120. (c)
															130. (b)
															140. (b)
															150. (b)
														• •	1 60 . (c)
	12. (d) 22. (d) 32. (c) 42. (b) 52. (c) 2. (b) 12. (d) 32. (a) 42. (a) 62. (d) 72. (d) 82. (b) 92. (c) 02. (d) 12. (c) 22. (b) 32. (d) 42. (a)	12. (d) 13. 22. (d) 23. 32. (c) 33. 42. (b) 43. 52. (c) 23. 32. (a) 33. 42. (a) 43. 52. (d) 63. 72. (d) 79. 82. (b) 83. 92. (c) 93. (d) 103. (12. (c) 113. (22. (b) 123. (d) 133. (d) 133. (d) 143. (e) 1	12. (d) 13. (a) 22. (d) 23. (d) 32. (c) 33. (c) 42. (b) 43. (b) 52. (c) 23. (d) 32. (a) 33. (c) 42. (a) 43. (b) 52. (a) 53. (b) 62. (d) 63. (a) 72. (d) 79. (d) 82. (b) 83. (d) 92. (c) 93. (b) 02. (d) 103. (a) 12. (c) 113. (b) 22. (b) 123. (b) 32. (d) 133. (b) 42. (a) 143. (b)	12. (d) 13. (a) 14. 22. (d) 23. (d) 24. 32. (c) 33. (c) 34. 42. (b) 43. (b) 44. 52. (c) 23. (d) 24. 32. (a) 33 (c) 34. 42. (a) 43 (b) 44. 52. (a) 53. (b) 54. 62. (d) 63 (a) 64. 72. (d) 79. (d) 74. 82. (b) 83. (d) 84. 92. (c) 93. (b) 94 02. (d) 103. (a) 104. 12. (c) 113. (b) 114 22. (b) 123. (b) 124, 32. (d) 133. (b) 134 42. (a) 143. (b) 144,	12. (d) 13. (a) 14. (b) 22. (d) 23. (d) 24. (a) 32. (c) 33. (c) 34. (a) 42. (b) 43. (b) 44. (a) 52. (c) 2. (b) 3. (a) 4. (a) 12. (d) 13. (b) 14 (a) 22. (b) 23. (d) 24. (d) 32. (a) 33. (c) 34. (b) 42. (a) 43. (b) 44. (a) 52. (a) 53. (b) 54. (c) 62. (d) 63. (a) 64. (b) 72. (d) 73. (d) 74. (a) 82. (b) 83. (d) 84. (b) 92. (c) 93. (b) 94. (b) 92. (c) 93. (b) 94. (a) 12. (c) 113. (b) 114. (a) 22. (b) 123. (b) 124. (b) 32. (d) 133. (b) 134. (c) 42. (a) 143. (b) 144. (d)	12. (d) 13. (a) 14. (b) 15. 22. (d) 23. (d) 24. (a) 25. 32. (c) 33. (c) 34. (a) 35. 42. (b) 43. (b) 44. (a) 45. 52. (c) 2. (b) 3. (a) 4. (a) 5. 12. (d) 13. (b) 14 (a) 15. 22. (b) 23. (d) 24. (d) 25. 32. (a) 33. (b) 44. (a) 45. 52. (a) 53. (b) 54. (c) 55. 62. (d) 63. (a) 64. (b) 65. 72. (d) 73. (d) 74. (a) 75. 82. (b) 83. (d) 84. (b) 85. 92. (c) 93. (b) 94. (b) 95. 02. (d) 103. (a) 104. (a) 105. 12. (c) 113. (b) 114. (a) 125. 22. (b) 123. (b) 124. (b) 125. 32. (d) 133. (b) 134. (c) 135. 42. (a) 143. (b) 144. (d) 145.	12. (d) 13. (a) 14. (b) 15. (b) 22. (d) 23. (d) 24. (a) 25. (b) 32. (c) 33. (c) 34. (a) 35. (d) 42. (b) 43. (b) 44. (a) 45. (b) 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 12. (d) 13. (b) 14 (a) 15 (b) 22. (b) 23. (d) 24. (d) 25 (a) 32. (a) 33 (c) 34. (b) 35 (a) 42. (a) 43 (b) 44. (a) 45 (d) 52. (a) 53. (b) 54. (c) 55 (d) 62. (d) 63 (a) 64. (b) 65 (c) 72. (d) 73. (d) 74. (a) 75 (d) 82. (b) 83. (d) 84. (b) 85. (a) 92. (c) 93. (b) 94 (b) 95. (c) 02. (d) 103. (a) 104. (a) 105. (b) 12. (c) 113. (b) 134 (c) 135. (c) 42. (d) 133. (b) 134. (c) 135. (c) 42. (a) 143. (b) 134. (d) 145. (c)	12. (d) 13. (a) 14. (b) 15. (b) 16. 22. (d) 23. (d) 24. (a) 25. (b) 26. 32. (c) 33. (c) 34. (a) 35. (d) 36. 42. (b) 43. (b) 44. (a) 45. (b) 46. 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. 12. (d) 13. (b) 14 (a) 15 (b) 16. 22. (b) 23. (d) 24. (d) 25 (a) 26 32. (a) 33 (c) 34. (b) 35 (a) 36. 42. (a) 43 (b) 44. (a) 45 (d) 46. 52. (a) 53. (b) 54. (c) 55 (d) 56. 62. (d) 63 (a) 64. (b) 65 (c) 66. 72. (d) 73. (d) 74. (a) 75 (d) 76. 82. (b) 83. (d) 84. (b) 85. (a) 86. 92. (c) 93. (b) 94 (b) 95. (c) 96. 02. (d) 103. (a) 104. (a) 105. (b) 106. 12. (c) 113. (b) 114 (a) 115. (b) 116. 22. (b) 123. (b) 124. (b) 125. (b) 126. 32. (d) 133. (b) 134. (c) 135. (c) 136. 42. (a) 143. (b) 144. (d) 145. (c) 146.	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 32. (a) 33 (c) 34. (b) 35 (a) 36. (d) 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 72. (d) 73. (d) 74. (a) 75 (d) 76. (a) 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 92. (c) 93. (b) 94 (b) 95. (c) 96. (c) 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 12. (c) 113. (b) 114. (a) 115. (b) 116. (c) 22. (b) 123. (b) 124. (b) 125. (b) 126. (c) 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 42. (a) 143. (b) 144. (d) 145. (c) 146. (b)	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. 32. (a) 33 (c) 34. (b) 35 (a) 36. (d) 37 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 72. (d) 73. (d) 74. (a) 75 (d) 76. (a) 77. 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 87 92. (c) 93. (b) 94. (b) 95. (c) 96. (c) 97. 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 107. 12. (c) 113. (b) 114. (a) 125. (b) 126. (c) 127. 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 137 42. (a) 143. (b) 144. (d) 145. (c) 146. (b) 1.77	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. (c) 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. (d) 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. (b) 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 (b) 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 (d) 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. (a) 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. (a) 32. (a) 33 (c) 34. (b) 35 (a) 36. (d) 37 (c) 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 (d) 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 (a) 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 (c) 72. (d) 79. (d) 74. (a) 75. (d) 76. (a) 77. (b) 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 87 (b) 92. (c) 93. (b) 94. (b) 95. (c) 96. (c) 97. (d) 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 107. (c) 12. (c) 113. (b) 114. (a) 125. (b) 126. (c) 127. (c) 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 137 (b) 42. (a) 143. (b) 144. (d) 145. (c) 146. (b) 147. (a)	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. (c) 18. 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. (d) 28. 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. (b) 38. 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 (b) 48. 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 (d) 8. 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. (a) 18. 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. (a) 28. 32. (a) 33 (c) 34. (b) 35. (a) 36. (d) 37 (c) 38. 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 (d) 48. 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 (a) 58. 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 (c) 68. 72. (d) 79. (d) 74. (a) 75. (d) 76. (a) 77. (b) 78. 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 87 (b) 88. 92. (c) 93. (b) 94. (b) 95. (c) 96. (c) 97. (d) 98. 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 107. (c) 108. 12. (c) 113. (b) 114. (a) 125. (b) 126. (c) 127. (c) 128. 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 137 (b) 138. 42. (a) 143. (b) 144. (d) 145. (c) 146. (b) 147. (a) 148.	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. (c) 18. (b) 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. (d) 28. (a) 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. (b) 38. (b) 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 (b) 48. (a,b) 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 (d) 8. (b) 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. (a) 18. (d) 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. (a) 28. (c) 32. (a) 33 (c) 34. (b) 35. (a) 36. (d) 37 (c) 38. (c) 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 (d) 48. (b) 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 (a) 58. (d) 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 (c) 68. (c) 72. (d) 79. (d) 74. (a) 75. (d) 76. (a) 77. (b) 78. (c) 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 87 (b) 88. (c) 92. (c) 93. (b) 94. (b) 95. (c) 96. (c) 97. (d) 98. (c) 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 107. (c) 108. (d) 12. (c) 113. (b) 114. (a) 125. (b) 126. (c) 127. (c) 128. (a) 32. (d) 133. (b) 124. (b) 125. (b) 126. (c) 127. (c) 128. (a) 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 137 (b) 138. (a) 42. (a) 143. (b) 144. (d) 145. (c) 146. (b) 147. (a) 148. (c)	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. (c) 18. (b) 19. 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. (d) 28. (a) 29. 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. (b) 38. (b) 39. 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 (b) 48. (a,b) 49. 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 (d) 8. (b) 9. 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. (a) 18. (d) 19. 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. (a) 28. (c) 29. 32. (a) 33 (c) 34. (b) 35 (a) 36. (d) 37 (c) 38. (c) 39. 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 (d) 48. (b) 49. 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 (a) 58. (d) 59. 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 (c) 68. (c) 69. 72. (d) 73. (d) 74. (a) 75. (d) 76. (a) 77. (b) 78. (c) 79.	12. (d) 13. (a) 14. (b) 15. (b) 16. (b) 17. (c) 18. (b) 19. (b) 22. (d) 23. (d) 24. (a) 25. (b) 26. (d) 27. (d) 28. (a) 29. (d) 32. (c) 33. (c) 34. (a) 35. (d) 36. (b) 37. (b) 38. (b) 39. (a) 42. (b) 43. (b) 44. (a) 45. (b) 46. (a,d) 47 (b) 48. (a,b) 49. (a,c,d) 52. (c) 2. (b) 3. (a) 4. (a) 5 (b) 6. (a) 7 (d) 8. (b) 9. (c) 12. (d) 13. (b) 14 (a) 15 (b) 16. (c) 17. (a) 18. (d) 19. (c) 22. (b) 23. (d) 24. (d) 25 (a) 26 (a) 27. (a) 28. (c) 29. (d) 32. (a) 33 (c) 34. (b) 35 (a) 36. (d) 37 (c) 38. (c) 39. (b) 42. (a) 43 (b) 44. (a) 45 (d) 46. (a) 47 (d) 48. (b) 49. (b) 52. (a) 53. (b) 54. (c) 55 (d) 56. (a) 57 (a) 58. (d) 59. (c) 62. (d) 63 (a) 64. (b) 65 (c) 66. (d) 67 (c) 68. (c) 69. (a) 72. (d) 73. (d) 74. (a) 75. (d) 76. (a) 77. (b) 78. (c) 79. (b) 82. (b) 83. (d) 84. (b) 85. (a) 86. (c) 87 (b) 88. (c) 89. (d) 92. (c) 93. (b) 94. (b) 95. (c) 96. (c) 97. (d) 98. (c) 99. (a) 02. (d) 103. (a) 104. (a) 105. (b) 106. (b) 107. (c) 108. (d) 109. (b) 12. (c) 113. (b) 114. (a) 125. (b) 126. (c) 127. (c) 128. (a) 129. (c) 32. (d) 133. (b) 134. (c) 135. (c) 136. (b) 137. (b) 138. (a) 139. (d) 42. (a) 143. (b) 144. (d) 145. (c) 146. (b) 147. (a) 148. (c) 149. (d)

Exercise-2: More Than One Correct Answers

] 1.	(b, d)	2.	(a, b)	3.	(c, d)	4.	(b, c)	5.	(a, b, c)	6.	(a, b, c, d)
7.	(a, d)	8.	(e, b, d)	9.	(b, c, d)	10.	(b, d)	21,	(a, b, c)	12.	(a, b, d)
13.	(a, b, c)	14.	(a, b, d)	15.	(a, b, c)	16.	(a, b, c)	17.	(a, c, d)	18.	(a, b, c)
19.	(c, ď)	20.	(b, d)	21.	(a, b, c, d)	22.	(a, b, d)	23.	(a, b, c, d)	24.	, (b, c)
25.	(a, b, c)	26.	(a, b, c)	27	(b, c)	2€.	(a, c, d)	29.	(a, b)	36.	(b, c)
31.	(a, b)	32.	(b, d)	33.	(a, b, c)	34.	(a, b, c, d)	35.	(c, d)	36.	(b, c)
87	(b, c, d)	38.	(a, d)	39 .					(a, b, c, d)		
43 ,	(a, b, c)	44.	(a, b, c)	4 5.	(c, d)	46.	(a, d)	47.	(b, c)	48.	(a, b, d)
	(ხ, ჺ, ძ)			_					•		

Exercise-3: Linked Comprehension Type

1. (c)	2. (d)	3. (b)	4. (a)	5. (b)	6. (c)	7. (c)	8. (b)	9. (a)) (b)
11. (d)	12. (a)	13. (d)	14. (a)	15. (d)	16. (b)	17. (c)	18. (a)	19. (d)	20. (c)
11. (d) 21. (a)	22 . (b)	23. (d)	24. (a)	25. (b)	26 . (c)	27. (d)	28. (b)	29, (a)	30. (c)
31 (c)	32. (b)	33. (d)							

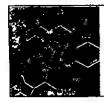
Exercise-4: Matrix Match Type

1. (a) → Q, R;	(b) $\rightarrow P, Q, S$;	(c) → P, R, S;	$(d) \rightarrow R, S$
2. (a) $\rightarrow Q, R, S$;	(b) $\rightarrow P, S$;	(c) $\rightarrow R$;	$(d) \rightarrow Q, S$
3. (a) $\rightarrow P, Q, S$;	(b) $\rightarrow P, Q, R, S$	(c) $\rightarrow P$;	$(d) \rightarrow Q, R, S$
4. (a) $\rightarrow P, Q, S$;	(b) $\rightarrow P$;	(c) $\rightarrow P, Q, S$;	$(d) \rightarrow P, Q, S$
5. (a) → P, Q, S;	(b) $\rightarrow R$, S ;	(c) \rightarrow Q;	$(d) \rightarrow R, S$
6. (a) \rightarrow Q, R, S;	(b) $\rightarrow P$, S;	(c) \rightarrow Q, S	(d) $\rightarrow P, R, S$
7. (a) $\rightarrow R, S$;	(b) $\rightarrow P, Q, R, S$;	(c) $\rightarrow Q,R$;	$(d) \rightarrow P, Q, R, S$
8. (a) $\rightarrow Q, R$;	(b) $\rightarrow P, R, T$;	$(c) \rightarrow Q, R$	(d) $\rightarrow R, S, T$
9. (a) → P, R;	(b) \rightarrow S;	(c) $\rightarrow Q$;	$(d) \rightarrow S, Q$
10. (a) → Q,R;	(b) $\rightarrow Q$, S;	(c) $\rightarrow P, Q, R$;	$(d) \rightarrow Q, R, T$
11. (a) $\rightarrow P_{\bullet}Q$;	$(b) \rightarrow P, Q;$	(c) $\rightarrow R, S_i^*$	$(d) \rightarrow P, Q$

Exercise-5: Integer Answer Type Problems

															1
1.	(5)	2. (5) 3	, (6)	4. (2,	1) 5.	(6)	<u>6. (4)</u>	7.	(5)	8. (4)	<u>9.</u>	(3)	10.	<u>(3)</u>





Carboxylic Acids and Its Derivatives



EXERCISE-1 ONLY ONE CORRECT ANSWER





1. Which of the following products is formed when adipic acid is heated?

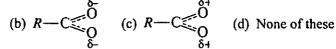
$$\begin{array}{c} \text{CH}_2 - \text{CH}_2 \\ \text{(a)} & \text{CH}_2 - \text{CH}_2 \\ \text{CH}_2 - \text{CH}_2 \text{CO} \\ \end{array}$$

(b)
$$\begin{vmatrix} CH_2 - CH_2 \\ CH_2 - CH_2 \end{vmatrix}$$
 $C = 0$

(c) $\begin{array}{c} \text{CH}_2 - \text{CH}_2 \text{CO} \\ \mid \\ \text{CH}_2 - \text{CH}_2 \text{CO} \end{array}$

CH2-CH2COOH (d) | CH₂—CH₂COOH

- 2. CH₃CH(OH)COOH molecule shows:
 - (a) geometrical isomerism
- (b) metamerism
- (c) optical isomerism (d) tautomerism
- 3. Which of the following is the best representation of the structure of the carboxylate ion?



- 4. The correct order of decreasing acid strength of trichloroacetic acid (A), trifluoroacetic acid (B), acetic acid (C), and formic acid (D) is:
 - (a) A > B > C > D (b) A > C > B > D (c) B > A > D > C (d) B > D > C > A
- 5. Identify Z in sequence.

 $CH_3COONH_4 \xrightarrow{(i) Heat} Y \xrightarrow{H_2O(H^+)} Z$

(a) CH₃CH₂CONH₂

(b) CH₂CN

(c) CH₃COOH

- (d) (CH₃CO)₂O
- 6. A halogen compound 'A' on hydrolysis with dilute alkali followed by acidification gives acetic acid. The compound X is:
 - (a) ClCH₂CH₂Cl (b) CH₃CHCl₂ (c) ClCH₂CHCl₂ (d) CH₃CCl₃
- 7. Which of the following statements are false about HCOOH?
 - (a) It is a stranger acid than CH₃COOH
 - (b) It forms formyl chloride with PCl₅
 - (c) It gives CO and H₂O on heating with conc. H₂SO₄
 - (d) It reduces Tollen's reagent

8. In a set of the given reactions, acctic acid yields a product C. Product C would be: $CH_3COOH + PCl_5 \longrightarrow A \xrightarrow{C_6H_6} B \xrightarrow{(i)} C_2H_5MgBr/ether C$ (b) CH₃COC₆H₅ (a) CH₃CH(OH)C₂H₅ (c) $CH_3CH(OH)C_6H_5$ (d) $CH_3-C-(OH)C_6H_5$ 9. In the given reaction final compound (L) is: COOH $\xrightarrow{C_2 H_5 OH} (K) \xrightarrow{(i) C_6 H_5 MgBr (excess)} (L)$ C₆H₅—C COOH₂H₅ ∠NO₂ (b) (d) (c) 10. The acid D obtained through the following sequence of reactions is: $C_2H_5Br \xrightarrow{Alc. KOH} A \xrightarrow{Br_2} B \xrightarrow{KCN} C \xrightarrow{H_3O^+}$ (b) malanic acid (c) maleic acid (d) oxalic acid (a) succinic acid 11. Carboxylic acid group can be detected by which test? (a) Sodium bisulphite test
(b) Fenning 3 00101
(d) With NaHCO₃ (b) Fehling's solution test 12. Phenol is a weaker acid than acetic acid because: (a) phenoxide ion is better stabilized by resonance than acetate ion (b) acetate ion is better stabilized by resonance than phenoxide ion (c) phenol is less soluble in water than acetic acid (d) both phenoxide ion and acetate ion are equally stable 13. Which of the following is the weakest acid? (a) Cl₃CCOOH (b) Cl₂CHCOOH (c) ClCH₂COOH (d) CH₃COOH 14. Which of the following dicarboxylic acids contain the most acidic hydrogen?

(a) Maleic acid (b) Fumaric acid (c) Succinic acid (d) Malonic acid

15. Which of the following sets of reagents X and Y will convert propanoic acid into alanine (an amino acid)?

O
Br
O
NH₃

$$H_3C-CH_2-C-OH \xrightarrow{\chi'} H_3C-CH-C-OH \xrightarrow{\gamma} H_3C-CH-C-COO^-$$
(2) Br
NaNH
(b) Br
(c) Rr
(c) Rr
(c) Rr
(d) Rr
(d)

(a) Br₂, NaNH₂

(b) Br₂/P, NaOH

(c) Br_2/P , NH_3

- (d) Br₂/HBr, NaNH₂
- **16.** Identify Z in the following reaction sequence

$$CH_3I \xrightarrow{Mg} X \xrightarrow{Dry} Y \xrightarrow{(i) P+Cl_2} Z$$

- (a) CH₃COOH
- (b) CH₂MgI
- (c) CH₃COCl (d) ClCH₂COOH
- 17. $R CH_2 CH_2OH$ can be converted into RCH_2CH_2COOH . The correct sequence of reagent is:
 - (a) PBr₃, KCN, H⁺

(b) PBr₃, KCN, H₂

(c) KCN, H⁺

- (d) HCN, PBr₃, H⁺
- 18. $(CH_3)_2C = CHCOCH_3$ can be oxidised to $(CH_3)_2C = CHCOOH$ by:
 - (a) Chromic acid (b) NaOI
- (c) Cu at 300° C (d) KMnO₄

19. The compound B is :

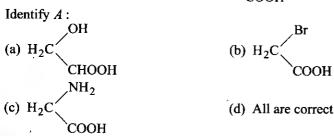
$$CH_3CH_2COOH \xrightarrow{Cl_2} A \xrightarrow{Alc. KOH} B$$

(a) CH₃CH₂OH

(c) $CH_2 = CHCOOH$

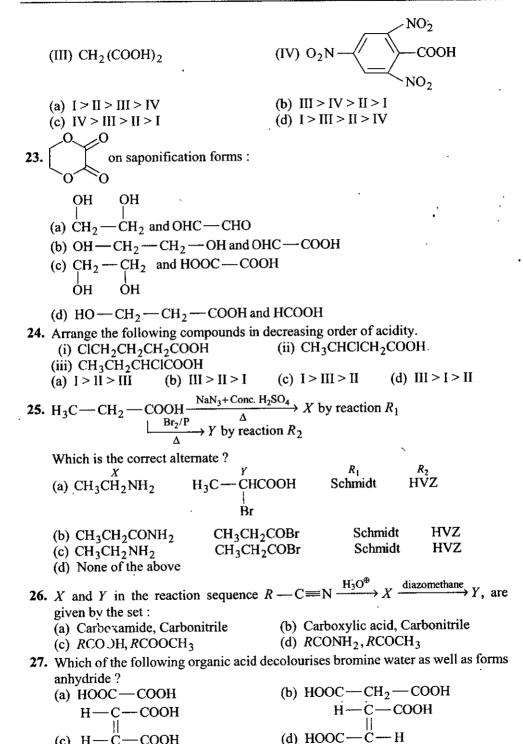
- (b) CH₃CH₂COCl (d) CH₃—CHCl—COOH
- **20.** $A \leftarrow \frac{\text{red P}}{\text{Hl}} \text{ CH}_3 \text{COOH} \xrightarrow{\text{LiAlH}_4} B$. What is not true for A and B?
 - (a) A is hydrocarbon of general formula C_nH_{2n+2} while B belongs to alkanol
 - (b) A can be obtained by reducing CH₃CH₂Cl while B by its hydrolysis
 - (c) A is alkene while B is alcohol
 - (d) A and B both belong to different homologous series

21. In the reaction
$$A \xrightarrow{\text{KCN}} B \xrightarrow{\text{H}_3 \overset{\oplus}{\text{O}}} \text{H}_2 \text{C}$$
COOH



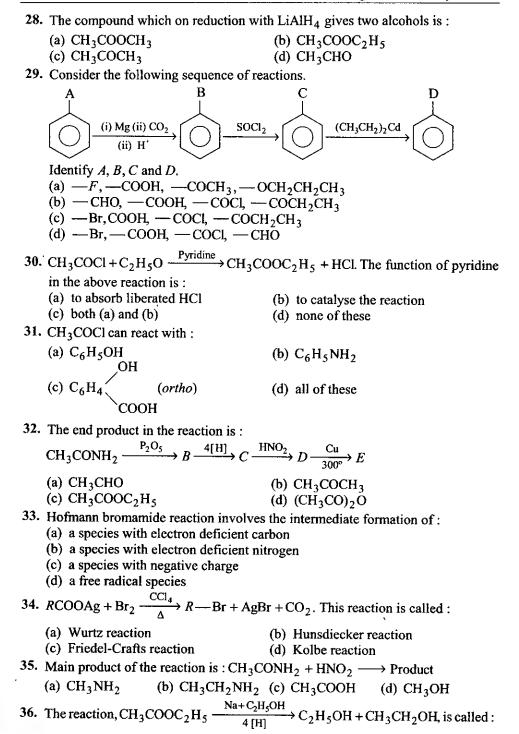
- 22. Give the order of sodalime decarboxylation of the following acid.
 - (I) CH₃COOH

(II) $CH_2 = CH - CH_2 - COOH$



(b) Claisen condensation

(a) Claisen reduction



- (c) Bouveault-Blanc reduction
- (d) Tischenko reduction
- 37. The reaction $CH_3CONH_2 \xrightarrow{NaOBr}$, gives :
 - (a) CH₃Br
- (b) CH₄
- (c) CH₃OBr
- (d) CH₃NH₂
- 38. The reaction of acetaldehyde in the presence of Al(OC₂H₅)₃ produces:
 - (a) CH₃CH(OH)CH₂CHO
- (b) $CH_3CH = CH CHO$

(c) CH₃COOC₂H₅

- (d) No reaction
- 39. Methyl acetate on treating with excess of C₂H₅MgBr produces:

(a)
$$CH_3$$
 $-C$ $-C$ OH CH_3

(c)
$$C_2H_5$$
 C_2H_5 C_2H_5 C_2H_5

(d)
$$CH_3 - C - OH$$

 C_2H_5

40. In a set of reactions, propionic acid yielded a compound (D).

$$CH_3CH_2COOH \xrightarrow{SOCl_2} (B) \xrightarrow{NH_3} (C) \xrightarrow{KOH} (D)$$

The structure of (D) would be:

(a) CH₃CH₂NHCH₃

(b) CH₃CH₂NH₂

(c) CH₃CH₂CH₂NH₂

- (d) CH₃CH₂CONH₂
- 41. The end product in the following series of reaction is:

$$CH_3COOH \xrightarrow{NH_3} (A) \xrightarrow{Heat} (B) \xrightarrow{P_2O_5} (C)$$

(a) CH₄

(b) CH₃OH

(c) acetonitrile

- (d) ammonium acetate
- 42. The end product in the following sequence is:

Acetamide
$$\xrightarrow{P_2O_5} (A) \xrightarrow{4H} (B)$$

- (a) CH₃NH₂

- (b) $C_2H_5NH_2$ (c) CH_3CN (d) CH_3COONH_4
- 43. $C_6H_5COOCH_3 + {}^{18}OH^- \longrightarrow A + B$

In the above reaction, products A and B respectively are:

(a)
$$C_3H_5C-O^- + CH_3O^{18}H$$
 (b) $C_2H_5-C-\overline{O}^{18} + CH_3OH$ (c) $C_2H_5-C-\overline{O}^{18} + CH_3OH$ (d) $C_2H_5-C-O^- + CH_3OH$

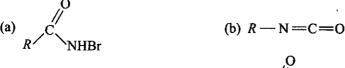
(b)
$$C_2H_5 - \overline{C} - \overline{O}^{18} + CH_3OH_3$$

(c)
$$C_2H_5 - \overline{O}^{18} + CH_3OH$$

(d)
$$C_2H_5 - C - O^- + CH_3OH$$

with a mixture of Br₂ and KOH given R—NH₂ as a 44. The reaction of

product. The intermediates involved in this reaction are:



- 45. In which of the following reactions propionic anhydride is not obtained?
 - (a) $CH_3CH_2COOH \xrightarrow{P_2O_5/\Delta}$
 - (b) CH₃CH₂COCl+CH₃CH₂COONa →
 - (c) $CH_3CH_2COOH + (CH_3CH_2CO)_2O \xrightarrow{\Delta}$
 - (d) $CH_3CH_2COOH + (C_3H_7CO)_2O \xrightarrow{\Delta}$
- **46.** Z = ? for following reaction:

$$CH_3CHO \xrightarrow{MnO_4} X \xrightarrow{SOCl_2} Y \xrightarrow{CH_3COONa} Z$$

(a) CH₃CHO

- (c) (CH₃)₂CHCH₂COOH
- (b) (CH₃CO)₂O (d) (CH₂CICO)₂O
- 47. Which one of the following is an example of Rosenmund's reduction?

(a)
$$CH_3COCl \xrightarrow{H_2} CH_3CHO + HCl$$

(b)
$$CH_3C = N \xrightarrow{(i) SnCl_2 - HCl} CH_3CHO + NH_4Cl$$

(c)
$$CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH + H_2O$$

(d)
$$CH_3COCI \xrightarrow{LiAlH_4} CH_3CH_2OH + HCl$$

- 48. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is:
 - (a) MeCOOCOMe (b) MeCHO
- (c) MeCOOMe
- (d) MeCOCl

49. In a reaction,

$$(A) \xrightarrow{\text{NH}_3} (B) \xrightarrow{\text{Heat}} (C) \xrightarrow{\text{P}_2\text{O}_5} \text{C}_2\text{H}_5\text{CN}$$

- (A), (B) and (C) are:
- (a) CH₃COOH, CH₃COONH₄ and CH₃CONH₂
- (b) CH₃COCl, CH₃CONH₂ and CH₃COONH₄



- (c) C₂H₅COOH, C₂H₅COONH₄ and C₂H₅CONH₂
- (d) $C_2H_5CONH_4$, $C_2H_5CONH_2$ and C_2H_5COOH
- **50.** Which of the following esters cannot undergo Claisen self condensation?
 - (a) CH₃CH₂CH₂CH₂COOC₂H₅
- (b) $C_6H_5COOC_2H_5$
- (c) C₆H₁₁CH₂COOC₂H₅
- (d) C₆H₅CH₂COOC₂H₅



1.
$$H_3C$$
— C = CH $\xrightarrow{CH_3MgBr}$ $CH_4 + A$ $\xrightarrow{CO_2}$ $\xrightarrow{H_3^{\oplus}O}$ B

B will be:

- (a) $\langle \rangle$ (b) $\langle \rangle$ (c) $\langle \rangle$ (d)
- 2. Consider the given reaction; $RCOOAg \xrightarrow{Br_2/\Delta} R$ —Br

Which one of the following acids will give maximum yield of R—Br in the above reaction?

(d) All will give same yield

3. Ph—COOH
$$\xrightarrow{\text{CH}_3}$$
 COOH $\xrightarrow{\text{Conc. H}_2\text{SO}_4}$ Ph—NH₂

The above reaction is known as:

(a) Schmidt reaction

- (b) Curtius reaction
- (c) Hofmann rearrangement
- (d) Lossen rearrangement

4. Ph—CH—C—OH
$$\xrightarrow{\Delta}$$
 (X)
OH

(X) will be:

(a) Ph---CH-

(b) Ph—CH=C=O

(d) none of these

O

- (a) Claisen rearrangement
- (b) Tischenko reaction

(c) Perkin reaction

(d) Cannizzaro reaction

6.
$$CH_3 + CH_3 - C - OC_2H_5 \xrightarrow{C_2H_5O^{\Theta}Na^{\oplus}} (X)$$

(X) will be:

7. Which one of the following compounds gives carboxylic acid with HNO₂?

(X) will be:

- 15. PhCOOH and Ph—CH₃ can be separated by:
 - (a) NaHCO₃

(d) Both are (

(b) aq. $NaHCO_3 + n$ -Hexane

(c) H₂O

(d) n-Hexane

16.
$$\langle O \rangle$$
 -NH₂ $\xrightarrow{\text{(CH}_3CO)_2O}$ $X \xrightarrow{\text{LiAlH}_4}$ Y

Find out structure of Y:

(a)
$$Ph$$

(b) Ph

(c) Ph

(d) Ph

(d) Ph

(e) Ph

(f) Ph

(f) Ph

(g) Ph

(h) Ph

(h) Ph

(h) Ph

(h) Ph

(i) Ph

(ii) Ph

(iii) Ph

(iii) Ph

(iii) Ph

(iv) Ph

18. The correct sequence of reagents for the following conversion is:

$$(a) \xrightarrow{SOCl_2} \xrightarrow{Ag} \xrightarrow{CH_2N_2} (b) \xrightarrow{SOCl_2} \xrightarrow{CH_2N_2}$$

(c)
$$\xrightarrow{\text{CH}_2\text{N}_2} \xrightarrow{\text{SOCl}_2} \xrightarrow{\text{Ag}} \xrightarrow{\text{H}_2\text{O}}$$

$$(d) \xrightarrow{\text{Ag}} \xrightarrow{\text{SOCl}_2} \xrightarrow{\text{CH}_2\text{N}_2}$$

19.
$$(NaN_3) X \xrightarrow{\Delta} Product :$$

(a)
$$\langle \bigcirc \rangle$$
 -NH₂ only

$$(c)$$
 C —NH₂

20. Arrange the following amides according to their relative reactivity when treated with Br₂ in excess of strong base.

(a)
$$P > Q > R > S$$

(b)
$$R > S > P > Q$$

(c)
$$Q > P > S > R$$

(d)
$$S > P > Q > R$$

21. Which of the following compounds cannot give Hofmann rearrangement?

$$(a) \ Ph - C - C - NH_{2}$$

$$(b) \ CH_{3} - CH_{2} - C - NH - Ph$$

$$(c) \ O_{2}N - O - C - NH_{2}$$

$$(d) \ Ph - C - NH_{2}$$

COOMe

.,

The main product is:

25. I
$$\leftarrow 1. CO_2$$
 $\rightarrow 1. CO_2, NaHCO_3$ II $\rightarrow OH$

Product I and II are respectively:

26.
$$NH_2$$
(a) NH_2
(b) NH_2
(c) NH_2
(d) NH_2
 N

Product A and B are:

(a) Metamers

(b) Position isomer

(c) Enantiomer

- (d) Diastereomers
- 28. An optically active compound 'X' having molecular formula $C_4H_8O_3$. It evolves CO_2 with NaHCO $_3$. 'X' on reaction with LiAlH $_4$ give achiral compound. 'X' is:

(a)
$$OH$$
 (b) OH (c) OH (d) OH OH

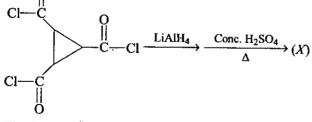
29. There are three isomeric tetracarboxylic acid.

Which of these form two isomeric monoanhydrides?

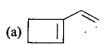
(a) only P

- (b) only P and Q (c) only Q
- (d) P, Q and R

The final product X is:



The final product (X) is:



31.

32. Consider the following sequence of reaction

$$A \xrightarrow{\stackrel{\ominus}{OH}} B + CH_3CH_2COO$$

$$(C_{11}H_{14}O_2) \qquad 1. KMnO_4/\stackrel{\ominus}{OH}$$

$$2. H^{\oplus}$$

$$COOH$$

The compound A is:

33. Following two methods are used for the preparation of acid

(I)
$$\rightarrow R$$
—Br $\xrightarrow{\text{Mg}} RMgBr \xrightarrow{1. \text{CO}_2} R$ —COOH
(II) $\rightarrow R$ —Br $\xrightarrow{\text{NaCN}} R$ —CN $\xrightarrow{\text{H}_3^{\oplus} \text{O}} R$ —COOH

Out of these two method which will be suitable for following conversion?

$$\begin{array}{c} CH_3 \\ CH_2 - C-Br \longrightarrow \\ CH_3 \end{array} \longrightarrow \begin{array}{c} CH_3 \\ CH_2 - C-COOH \\ CH_3 \end{array}$$

(a) Both I and II (b) Only I

(c) Only II

(d) None of these

34. Which reaction would best accomplish the following conversion?

$$OC_2H_5 \xrightarrow{?} OH$$

(a) LiAlH₄, Collins reagent

(b) NaBH₄, Jones reagent

(c) NaBH₄,CrO₃, H[⊕]

(d)
$$\left(\begin{array}{c} OH \\ /H^{\oplus}, NaBH_4, H_3^{\oplus}O \\ OH \end{array}\right)$$

38.
$$(I)$$
 (I) (I)

(a)
$$\langle O \rangle$$
 NH₂ (b) $\langle O \rangle$ OH OH

39.
$$H_3C$$
— C — $Cl + O : N — H — Major product :$

(a)
$$H_3C$$
— C — N

(c)
$$H_3C$$
— C — N — O

 $\xrightarrow{\text{NaOH, H}_2\text{O}} \text{Products}:$

(c) Both (a) and (b) (d) None of these

41. Find out structure of compound R:

$$P \xrightarrow{\text{PacN}} P \xrightarrow{\text{H}_3^{\Theta} O} Q \xrightarrow{\text{CH}_3\text{CH}_2\text{OH}} R$$
(a) Ph O (b) Ph OH (c) Ph (d) None of these
$$2H_2 \xrightarrow{\text{Pt}} COOH \xrightarrow{\Theta} OH$$

$$COOH \xrightarrow{\Theta} OH$$



Find out structure of compound (X):

43. (P); Product (P) will be :

44. $O \xrightarrow{1. \text{H/H}_2O} \text{Product}$:

45. $O \xrightarrow{\Theta} \xrightarrow{\Delta} A \xrightarrow{HCI} B \xrightarrow{\text{aq. KOH}} C$; Product C is:

$$(d)$$
 H

46. Which of the following compounds will undergo decarboxylation on heating?

47. Major product formed in the following reaction sequence is:

(a)
$$Ph$$

OH

OH

(b) Ph

Ph

 OC_2H_5
 OC_2H_5

49. Predict product formed in the following reaction:

$$(a) \xrightarrow{C_2H_5O^{\oplus} Na^{\oplus}} \xrightarrow{H^{\oplus}/H_2O} \xrightarrow{O}$$

$$(b) \xrightarrow{O} OH$$

$$(c) \xrightarrow{O} OH$$

$$(d) \xrightarrow{O} OH$$

50. What is the major product obtained in this reaction?

$$\begin{array}{c}
O & O \\
\hline
CH_3O^{\Theta}Na \\
\hline
CH_3OH
\end{array}
\xrightarrow{CH_3CH_2Br}
\xrightarrow{H_3^{\Theta}O}$$

. . .

51. What is the major product obtained from the following reaction?

52. Which of the following would be the best synthesis of 2, 2-dimethylpropanoic acid?

53. Which of the following can decarboxylated most easily?



54. In the esterification reaction:

$$H_3C$$
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3

Which of the following is formed as an intermediate?

55. Which of the following will not produce benzoic acid by oxidation with alkaline KMnO₄?

(a) Ph—CH₃ (b) Ph—CH₂—Cl (c) Ph—CH₂CH₃ (d) Ph—C—CH₃
$$\stackrel{CH_3}{\mid}$$
 CH₃ $\stackrel{C}{\mid}$ CH₃

56. Which of the following reactions does not involve decarboxylation?

(a)
$$CH_3COOAg + Br_2 \xrightarrow{CCl_4}$$
 (b) $OH \xrightarrow{\Delta}$ (c) $OH + Br_2 \xrightarrow{P}$

57. Which of the following reaction will give racemic mixture?

(a)
$$H \xrightarrow{COOH} H \xrightarrow{Br_2, P} COOH$$

$$CH_3 CH_2 COOH$$
(b) $H \xrightarrow{COOH} CH_2 COOH$

(c) HO
$$\xrightarrow{\text{COOH}}$$
 H $\xrightarrow{\text{PCl}_5}$ $\xrightarrow{\text{CH}_2\text{COOH}}$

(d)
$$H \xrightarrow{COOH} OH \xrightarrow{\Delta} CH_3$$

58. OH
$$\xrightarrow{\text{H}_2SO_4}$$
 Product:

(a)
$$H_2C = CH - CH_2 - CH_2 - C - OH$$
 (b) OH
(c) O (d) O

59.
$$O \longrightarrow OH \xrightarrow{Conc. H_2SO_4} Product :$$

- (c) CO₂ and CO (d) HCOOH
- 60. H—COOH and H—CHO can be distinguished by:
 - (a) Tollen's reagent

(b) Fehling's solution

(c) NaHCO3 solution

(d) HgCl₂ solution

61.
$$+ HCN \longrightarrow A \xrightarrow{H_3^{\oplus}O} B$$

The end product B is:

(a)
$$(b)$$
 (c) (d) (d)

62. Cl
$$\xrightarrow{\text{HCN}} A \xrightarrow{\text{KCN}} B \xrightarrow{\text{H}_3^{\oplus}\text{O}} C$$

The end product C is:

63. OH HO
$$H_2SO_4$$
 OH HO

$$\begin{array}{c|c}
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & \\
 & & & \\
 & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\
 & & & \\$$

Product (X) is:

65.
$$H_2C(COOEt)_2 \xrightarrow{1. EtO^{\Theta}Na^{\Theta}}$$

$$A \xrightarrow{1. \text{ KOH, } \Delta} B$$

The end product B will be:

66. The end product of reaction is:

$$O \xrightarrow{OH} \xrightarrow{P + Cl_2} \xrightarrow{KOH (alc.)}$$

The end product B will be:

(a)
$$\bigvee_{C = N}^{OH}$$
 (b) $\bigvee_{OH}^{C = N}$ (c) $\bigvee_{H_2C}^{O}$ (d) \bigvee_{OH}^{OH}

69. Consider the following sequence of reaction:

BaCO₃ + H₂SO₄
$$\longrightarrow$$
 X (gas)

Br $\xrightarrow{1. \text{Mg, THF}}$ Y; Y will be:

(a) OH

(b) OH

(c) OH

(d) H

(d) H

(d) H

(e) H

(d) H

(e) H

(f) H

(gas)

(f) H

(gas)

(gas)

(gas)

(h

(a) OH

(b) OH

(c) OH

(d) OH

(d) OH

(e) OH

(f) OH

(gas)

(a) OH

(b) OH

(c) OH

(d) OH

(d) OH

(d) OH

(e) OH

(gas)

(

(a)
$$H_2C =$$
 CH_2OH (b) $HO-CH_2 C-OH$ (c) HO CH_2OH (d) CH_2OH

71. Consider the following sequence of reaction:

$$\begin{array}{c}
A & \xrightarrow{\text{CrO}_3} B \xrightarrow{\text{warm}} + \text{CO}_2
\end{array}$$

The compound A is:

72. HO OH + O
$$(X)$$
; (X) will be:

73. HO OH
$$\xrightarrow{\text{KHSO}_4}$$
 (P); (P) will be:

(a)
$$\bigwedge^{\text{H}}$$
 (b) \bigwedge^{OH} OH (c) \bigwedge^{OH} OH (d) \bigvee^{OH}

74. HO OH
$$\xrightarrow{\text{OH}}$$
 OH $\xrightarrow{\text{(excess)}}$ (A); Product (A) will be:

(a) I I (b) (c) Y (d) I Y (75. O) CH₃
$$\xrightarrow{H_3^{\oplus}O}$$
 $A + CH_3 - C - H$ CH₂—COOH

Identify correct structure of A:

76.
$$\langle \bigcirc \rangle$$
 C $OH \xrightarrow{PCl_5} A \xrightarrow{Me_2NH} B$

Find structure of compound B:

(c)
$$C - O - N$$
Me

$$(\mathsf{d}) \left\langle \bigcirc \right\rangle - \overset{\parallel}{\mathsf{C}} - \overset{\oplus}{\mathsf{N}} \left\langle \bigcirc \right\rangle - \mathsf{Cl}^{\varepsilon}$$

77.
$$C \equiv N \xrightarrow{1. \text{ H}_3^{\oplus} \text{O}} X \xrightarrow{\text{AlCl}_3} Y$$

The structure of compound Y:

79. Consider the following sequence of reactions

$$\begin{array}{c}
COOH \\
\xrightarrow{\Delta} X \xrightarrow{CH_3OH} Y
\end{array}$$

The end product Y has structure:

(c)
$$(d)$$
 (d) (d)

Identify structure of major product:

82. Consider the following sequence of reactions

Ph OH
$$\xrightarrow{P_4O_{10}} A \xrightarrow{\text{LiAlH}_4} B$$

$$A + B \xrightarrow{\Delta} C + D(C_7H_6O_2)$$

The structure of compound C is:

.

83.
$$\underbrace{\frac{1. \text{ PhMgBr (excess)}}{2. \text{ H}_3^{\oplus} \text{O}}}_{\text{CH}_3}$$

The major product formed in the reaction is:

84. Cl
$$O$$
 + H₂ $\xrightarrow{\text{Pd, BaSO}_4}$ (X)

The structure of product (X):

85. The following esters are hydrolyzed by aqueous NaOH:

(a)
$$A < B < C < D$$
 (b) $C < B < D < A$ (c) $D < B < A < C$ (d) $C < D < A < B$

86.
$$COOH$$
 + $(CH_3COO)_2O \xrightarrow{\Delta} Product$:



87. Consider the following sequence of reaction

Ph—C=CH
$$\xrightarrow{\text{Hg}^{-2}} A \xrightarrow{\text{NaN}_3} B \text{ (Major)}$$

The structure of major product B is:

(a)
$$Ph$$
 CH_3 (b) Ph CH_3 (c) Ph CH_3 (d) CH_3 CH_3

The product of reaction is:

88.

89. Which of the following compounds will not liberate ammonia gas on refluxing with aqueous NaOH?

91. The major product of the reaction is:

$$(a) \bigcirc Ph$$

$$(b) Ph \bigcirc C \bigcirc CH_2 \bigcirc Ph$$

$$(c) Ph \bigcirc Ph$$

$$(d) \bigcirc Ph$$

$$(d) \bigcirc Ph$$

92.
$$N_3H \rightarrow Major product$$
:

(a)
$$NH_2$$
 (c) $N-H$ (d) $H-N$

93.
$$\bigcirc$$
 + Cl—CH₂—C—Cl—FeCl₃ \rightarrow (1 Mole)

Major product formed is:

(a)
$$Ph$$
 (b) Ph (c) Ph (d) Ph

94.
$$Ph$$

O

 Ph

O

 Ph
 Ph

95. The major product formed in the reaction:

OMe PhMgBr (excess)
$$H_3^{\oplus}O$$
(a) Ph
$$O$$
(b) Ph
$$O$$
(c) Ph
$$O$$
(d) Ph
$$O$$
Ph

96. The products obtained in the reaction

Ph
$$CCl_3$$
 $\xrightarrow{Conc. NaOH}$ Products:

- (a) Ph—CHO and CHCl₃
- (b) PhCHO and HCOO[⊕]Na [⊕]
- (c) Ph-CH2OH and CHCl3
- (d) PhCOO[⊖]Na[⊕], PhCH₂OH and HCOO[⊖]Na[⊕]
- 97. Identify the reaction among following which is not stated correctly:

$$(d) \bigcirc OH \\ + Br_2 \longrightarrow Br \bigcirc OH \\ Br$$

3)

98. The major product formed in the reaction:

$$(a) \qquad (b) \qquad (b) \qquad (c) \qquad (c) \qquad (d) \qquad (d) \qquad (d) \qquad (e) \qquad (e) \qquad (e) \qquad (e) \qquad (figure 1) \qquad (figure 2) \qquad (figure 2) \qquad (figure 3) \qquad (figure 3) \qquad (figure 3) \qquad (figure 4) \qquad (figure 4$$

99. Consider the following sequence of reactions

COOH
$$\begin{array}{c}
1. \text{ SOCl}_2 \\
\hline
2. \text{ AlCl}_3 \text{ (Anhydrous)}
\end{array}$$

$$A \xrightarrow{\text{Zn-Hg/HCl}} B \text{ ; Identify } B :$$

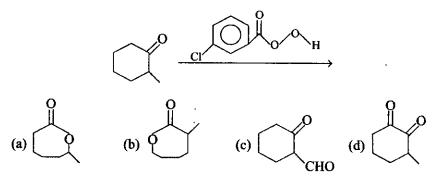
$$\begin{array}{c}
\text{(a)} \\
\text{(c)} \\
\end{array}$$

$$CH_2 \longrightarrow C_6H_5$$

$$\begin{array}{c}
\text{(d)} \\
\end{array}$$

$$CH_2 \longrightarrow Ph$$

100. The major product of the reaction:





101. Consider the following sequence of reaction

$$\begin{array}{c}
A & \xrightarrow{\stackrel{\Theta}{OH}} B + \text{CH}_3\text{CH}_2\text{COO}^{\stackrel{\Theta}{O}} \\
(C_{11}\text{H}_{14}\text{O}_2) & \text{COOH} \\
B & \xrightarrow{1. \text{KMnO}_4/\text{OH}} & & \text{COOH}
\end{array}$$

The compound A is:

(a) (b) (c) (d) (d) (102.
$$Cl$$
 Shr Shr

Identify structure of X':

(a)
$$Br$$
 S Br S Br S Br S Br S Br S Br S Br

103.
$$PhMgBr (excess) \rightarrow Product :$$

104.
$$NH_2$$
 $+$ Cl Cl P ; Product P will be:

(c)
$$\xrightarrow{\text{LiAIH}_4}$$
 $\xrightarrow{\text{Ph}}$ $\xrightarrow{\text{Cl}}$ (d) $\xrightarrow{\text{Zn-Hg/HCl}}$ $\xrightarrow{\text{CH}_3}$ $\xrightarrow{\text{C}}$ $\xrightarrow{\text{Cl}}$ (2) $\xrightarrow{\text{Cl}}$ $\xrightarrow{\text{Cl}}$ $\xrightarrow{\text{Cl}}$ (2) $\xrightarrow{\text{Cl}}$ $\xrightarrow{\text{Cl}}$ $\xrightarrow{\text{Cl}}$ (2) $\xrightarrow{\text{Cl}}$ $\xrightarrow{\text{Cl}}$

110. Br
$$\xrightarrow{1. \text{ NaOH, H}_2\text{O}} P$$
; Identify structure of product P :

$$(a) \qquad (b) \qquad OH \qquad (c) \qquad OH \qquad (d) \qquad COOH$$

111. Find out major product of following reaction:

112. Identify the major product of following reaction:

113. Find out correct sequence of reagents for following conversion:



115. Ph₂CH—C—OH
$$\xrightarrow{1.SOCt_2}$$
 2 Et₃ N, \triangle

(a)
$$Ph$$
 $C=C=O$

(b)
$$Ph$$
 $C=C < CI$ OH

(d) None of these

116. What would be the product of following reaction?

117. Which reaction occurs at the fastest rate?

118. Find out final product of following sequence of reaction:

119. Which is the major product of following reaction?

EXERCISE-2 MORE THAN ONE CORRECT ANSWERS



1. Which of the following are correct methods for the preparation of propanoic acid?

(a)
$$H_3C$$
— CH = CH_2 \xrightarrow{HBr} \xrightarrow{Mg} $\xrightarrow{CO_2}$ $\xrightarrow{H_1^{\oplus}O}$

(b)
$$H_3C$$
— C = CH $\xrightarrow{BH_3 \cdot THF}$ $\xrightarrow{KMnO_4}$ $\xrightarrow{KMnO_4}$

(c)
$$H_2C = CH_2 \xrightarrow{HBr} \xrightarrow{Mg} \xrightarrow{CO_2} \xrightarrow{H_3^{\oplus}O}$$

(d)
$$H_3C$$
— CH = C — CH_3 $\xrightarrow{O_3}$ $\xrightarrow{Ag_2O}$

2. Which of the following carboxylic acids do not undergo decarboxylation simply on heating?



3. Choose the incorrect rate of decarboxylation in the mentioned conditions:

(b) F_3C —COOH > Cl_3C —C—OH (decarboxylation on heating with sodalime)

(c)
$$O_2N$$
—COOH > H_3CO —COOH (decarboxylation on heating with H_2SO_4)

O

COOH

4. Which of the following ketoesters are not likely to have been prepared by Claisen condensation?

- 5. Which of the following reagents cannot be used for the reduction of carboxylic acid to alcohol?
 - (a) NaBH₄

(b) H2 and Pt catalyst

(c) LiAlH₄

(d) NaBH₃CN

Which of the following are intermediate species responsible for product?

(c)
$$R$$
— CH $=$ C — OH

7.
$$\stackrel{18}{\longrightarrow}$$
 Ph $\stackrel{\text{H}_2\text{O}, H^{\oplus}}{\longrightarrow}$ Products

Products are:

(a)
$$OH$$
 (b) OH (c) Ph (d) Ph

- 8. Find out correct orders:
 - (a) \wedge_{OH} > \rightarrow OH (Rate of esterification)
 - (b) \nearrow OH > \nearrow OH (Rate of esterification)
 - (c) $V_{Cl} > V_{Ol} > V_{Ol}$
 - (d) OH OH (Acidity)

Which of the following reagents can be used in step-1?

- (a) AlCl₃
- (b) HCl
- (c) PCl₅
- (d) SOCl₂
- 10. Ph $X \xrightarrow{\text{Cl}} \frac{\text{AlCl}_3}{\text{H}^{\oplus}, \Delta} X \xrightarrow{\text{Na}_2\text{Cr}_2\text{O}_7} Y \xrightarrow{\Delta} Z$
 - (a) X is O

(b) Y is COOH

(c) Y is COOH

- (d) Z is
- 11. H COOH $\xrightarrow{\Delta} X + Y$
 - (a) X is H COOH
 - (c) Y is H

- (b) X is COOH
- (d) Y is

12.
$$O$$

CH₃
 H^{\oplus}/H_2O
 $X + Y :$

CH₂COOH

(a) X is O

CH₃

CH₂COOH

(b) X is O

CH₃

CH₂COOH

(c) X is O

CH₃

CH₂COOH

(d) Y is C

CH₃

CH₃

CH₃

(e) Y is P

CH₂

CH—OH

CH₃

(f)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

(h)

CH₃

CH₃

(h)

CH₃

CH₃

(h)

CH₃

CH₃

CH₃

(h)

CH₃

16.
$$\longrightarrow$$
 + H₂CN₂ \longrightarrow X+ Y:

(a) X is \longrightarrow (b) \longrightarrow (c) \longrightarrow (d) \longrightarrow 17. \longrightarrow (l) \longrightarrow (b) \longrightarrow (c) \longrightarrow (d) \longrightarrow (d) \longrightarrow 17. \longrightarrow (e) Y is Dones reagent (d) II is SOBr₂

18. \longrightarrow CH₂ \longrightarrow (d) II is SOBr₂

18. \longrightarrow CH₂ \longrightarrow (e) \longrightarrow (f) \longrightarrow (f) Y is \longrightarrow (h) Y is \longrightarrow (

(a)
$$A$$
 is \bigcirc

(d)
$$C$$
 is \bigcirc

21. $C_4H_8O_4 \xrightarrow{\text{LiAlH}_4} \xrightarrow{\text{HBr}} \xrightarrow{\text{NaCN}} \xrightarrow{H_3O, \text{CaO}} Y \xleftarrow{\text{CaO}, \Delta} \text{hexanedioic acid}$:

22. Which of the following can be used for the synthesis of benzyl acetate?

(a)
$$Ph$$
— CH_2 — $OH + (CH_3CO)_2O$ —

(b)
$$C_6H_5$$
— $CH_2OH + CH_3$ — C — OH — OH
 O
 OH
 OH

(c)
$$C_6H_5CH_2OH + CH_3 - C - CI - OH$$

(d)
$$C_6H_5CH_2OH + CH_3COOH \xrightarrow{\text{NaOH}}$$

23. In which of the following reactions is benzoic acid the major product?

(a)
$$C_6H_5CH_2OH \xrightarrow{1. \text{KMnO}_4, \text{OH}}$$
 (b) $C_6H_5 - C - CH_3 \xrightarrow{\text{Cl}_2}$ (c) $C_6H_5MgBr \xrightarrow{CO_2}$ (d) $C_6H_5CH_3 \xrightarrow{\text{KMnO}_4, \text{OH}}$

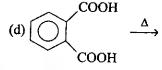
(b)
$$C_6H_5 - C - CH_3 - \frac{Cl_2 + NaOH}{H_3^{\oplus}O}$$

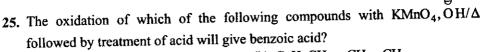
(c)
$$C_6H_5MgBr \xrightarrow{CO_2} H_3^{\oplus}O$$

(d)
$$C_6H_5CH_3 \xrightarrow{KMnO_4, OH} H_3^{\oplus}O$$

- 24. Acid anhydride can be prepared by:
 - (a) $C_6H_5COOH + CH_3COCI \xrightarrow{Pyridine}$

 - (b) $C_6H_5COO^{\Theta}Na^{\oplus} + C_6H_5COCl \longrightarrow$ (c) $C_6H_5CONH_2 + CH_3COO^{\Theta}Na^{\oplus} \longrightarrow$





(a) $C_6H_5CH_3$

(b) $C_6H_5CH = CH - CH_3$ O

||

(c) $C_6H_5C = C - CH_3$

26. The intermediates formed during the reaction:

$$C_6H_5CH_2COOAg + Br_2 \xrightarrow{CCl_4} C_6H_5CH_2Br$$

- (a) C_6H_5 — CH_2 —C—O• (b) C_6H_5 CH_2

(c) Br*

27. Which of the following reactions are used in the preparation of alcohols?

(a) $CH_3CH_2Br + aq. KOH \longrightarrow$ (b) $CH_3CH_2Br + aq. KOH \longrightarrow$

(a)
$$CH_3CH_2Br + aq. KOH \longrightarrow$$
 (b) \nearrow
(c) $Na/EtOH \longrightarrow$ (d) $CH_3CH_2CI \xrightarrow{H_2O}$
OCH₃
O

28.
$$R \longrightarrow C \longrightarrow R' \longrightarrow R' \longrightarrow C \longrightarrow NH \longrightarrow R$$

$$N \longrightarrow OH$$

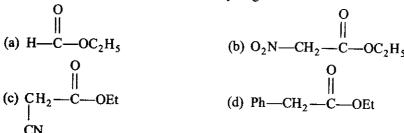
Which of the following statements are correct for above reaction?

- (a) Reaction is intermolecular
- (b) Reaction is acid catalysed
- (c) It is the trans hydrocarbon radical with respect to the --OH group that migrates.
- (d) The rearrangement is intramolecular
- 29. Which of the following statements are correct for benzoic acid?
 - (a) Nitration gives o-and p-nitrobenzoic acid
 - (b) Bromination gives m-bromo benzoic acid
 - (c) The Friedel-Crafts reaction with CH₃—C—Cl/AlCl₃ gives m-carboxy

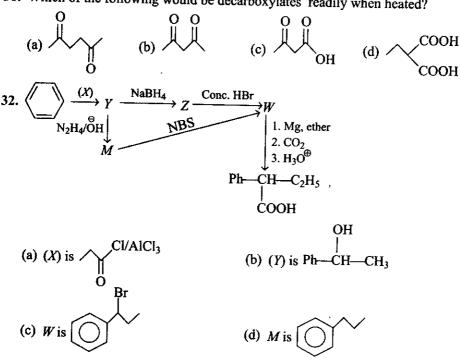
acetophenone.

(d) The reaction with oleum gives 3-sulphobenzoic acid

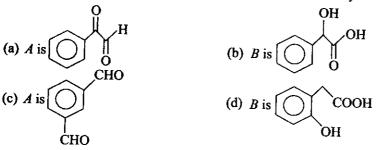
30. In which of the following esters the α -hydrogen is acidic?



31. Which of the following would be decarboxylates readily when heated?



33. Compound (A) $C_8H_6O_2$ on treatment with aq. NaOH followed by acidification gives (B) $C_8H_8O_3$ which on oxidation gives benzoic acid only:



34. Which of the following will liberate CO₂ on reaction with NaHCO₃?

35. In Hofmann bromamide degradation reaction

$$R \longrightarrow C \longrightarrow NH_2 + KOH + Br_2 \longrightarrow$$

intermediates are:

- (a) RCONHBr
- (b) RNCO
- (c) RNH₂ (d) none of these

36.
$$C_4H_{11}N + HNO_2 \longrightarrow C_4H_{10}O$$
 (3° alcohol)

- (X) will give:
- (a) carbylamine reaction
- (b) Hofmann mustard oil reaction
- (c) diazonium salt with HNO₂
- (d) base insoluble product with Hinsberg reagents

37. Which of the following compounds will give HVZ reaction?

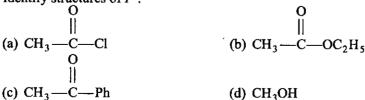
38. In the given reaction

$$\begin{array}{cccc}
O & O \\
\parallel & \parallel \\
R - C - OH \xrightarrow{(X)} R - C - O - CH
\end{array}$$

- (X) will be:
- (a) CH_2N_2
- (b) CH₃OH/H[⊕] (c) MeCOOH (d) Me₂SO₄

39.
$$P \xrightarrow{\text{PhMgBt}} \text{CH}_3 \xrightarrow{\text{C}} \text{Ph}$$

Identify structures of P:



40. An ester A of the formula $C_5H_8O_2$ on acidic, hydrolysis gives an acid B, which reduces Tollen's reagent and an alcohol C, which gives iodoform test. Ester A can also be converted into alcohol B by reaction with excess of Grignard reagent D.

O | | NaOH | 11.
$$H_3C-C-O-C=CH_2+H_2O-\underbrace{NaOH}_{H_3^{\oplus}O}X+Y$$

X and Y are:

(a)
$$X$$
 is CH_3 — C — O — CH_2 — Ph (b) Y is HCHO

O

(c) Y is H_3C — C — OH (d) X is Ph — C — CH_3

X and Y are:

(d) all of these

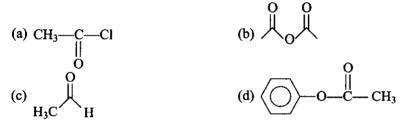
43. Ph—C—Ph—PhCO₃H
$$A$$
—LiAlH₄ $B + C$

B and C are respectively:



44. Which of the following decarboxylate on heating?

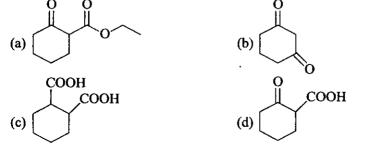
45. Which of the following will form Ph—NH—C—CH₃ on reaction with aniline?



46. In which of the following reaction phthalic acid can be formed?

(a)
$$O_3$$
 C_2 (b) C_2 C_3 C_4 C_4 C_5 C_4 C_5 C_4 C_5 C_4 C_5 C_5 C_6 C_7 C_8 $C_$

47. Which of the following compounds cannot undergo decarboxylation on heating?





48. Which of the following reactions can be used to prepare lactones (cyclic esters)?

(a)
$$OH \xrightarrow{OH} OH \xrightarrow{H^{\oplus}, \Delta}$$
 (b) $CI \xrightarrow{OH} OH \xrightarrow{NaHCO_3}$ (c) $HO \xrightarrow{OH} OH OH OH OH$ (d) $OCH_3 \xrightarrow{NaBH_4}$

49. Which of the following will give cyclic products upon being heated or being treated by an acid?

50. Consider the following reaction sequence:

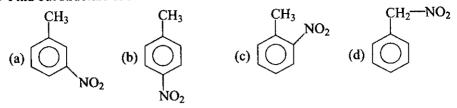
$$(B) \xleftarrow{2\text{CH}_3\text{MgBr}}_{\text{H}^{\oplus}/\text{H}_2\text{O}} (A) \xrightarrow{\text{H}^{\oplus}/\text{H}_2\text{O}} O\text{C}_2\text{H}_5$$
(a) Compound A can be $O\text{C}_2\text{H}_5$
(b) Compound A can be $O\text{C}_6\text{H}_5$
(c) Compound A can be $O\text{C}_6\text{H}_5$
(d) Compound A can be

EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

Compound A having molecular formula $C_7H_7NO_2$ can undergo reduction with Sn + HCl. Treatment of A with $KMnO_4$ gives a compound B ($C_7H_5NO_4$) which has lower boiling point compared to its other isomer. B when treated with $SOCl_2$ produces C. C when treated with CH_2N_2 produces D of molecular formula $C_8H_5N_3O_3$. D when treated with $C_8H_5N_3O_3$. D when treated with $C_8H_5N_3O_3$.

1. Find out structure of A:



2. Find out structure of C:

3. Find out structure of E:

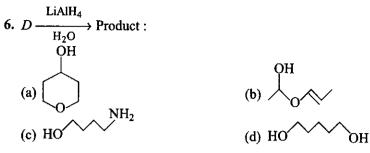
Passage-2

An organic compound A on acid hydrolysis produces B, an amino acid. B on treatment with HNO₂ gives C. C on heating with conc. H₂SO₄ produces a lactone D. A can also be synthesised by the reaction of cyclopentanone with H₂N—OH followed by treatment of conc. H₂SO₄.

4. What is the structure of compound A?

(a)
$$N-H$$
 (b) $N-H$

5. Find out structure of D:



Passage-3

An organic compound $(A)C_5H_{10}O_2$ reacts with Br_2 in presence of phosphorus to give (B). Compound (B) contains an asymmetric carbon atom and yields (C) on dehydrobromination. Compound (C) does not show geometrical isomerism and on decarboxylation gives an alkene (D) which on ozonolysis gives E and F. Compound (E) gives positive Schiff test but (F) does not.

7. Identify correct structure of A:

(a)
$$OH$$
 (b) OH (c) OH (d) None of these

8. Find out structure of D:

(a) (b) (c)
$$\rightarrow$$
 CH₂ (d) (d) (e) \rightarrow CH₂ (d) (e) \rightarrow CH₂ (d) (figure 1) \rightarrow CH₂ (figure 2) \rightarrow CH₂ (figu

Passage-4

Ph—C—O—CMe₃ + H^{$$\oplus$$} \longrightarrow Ph—C—O—CMe₃

CH₃ || Slow
Ph—C=O $\stackrel{\oplus}{\text{C}}$ $\stackrel{\oplus}{\text{C}}$ $\stackrel{\oplus}{\text{C}}$ $\stackrel{\oplus}{\text{H}_2O}$

H $^{\oplus}$ + Me₃C—OH $\stackrel{\oplus}{\text{C}}$ Me₃C—OH₂

10. Choose the correct case of hydrolysis for the following molecules:

(a)
$$P > Q > R > S$$
 (b) $P = Q = R = S$ (c) $S > R > Q > P$ (d) $Q > P > S > R$

O

H₂
O

11. CH_3 —C— $OCMe_3$ $\xrightarrow{H_2O_4}$ Products

12. Which of the following will give the racemised product on hydrolysis in presence of H₂SO₄?

Passage-5

The decarboxylation of β -ketoacids, β , γ -unsaturated acid and geminal diacid proceed through the formation of cyclic transition state in presence of heat.

$$\begin{array}{ccccc}
O & O & O \\
\parallel & \parallel & \parallel \\
CH_3 - C - CH_2 - C - OH \xrightarrow{\Delta} CH_3 - C - CH_3
\end{array}$$

Mechanism:

13. Find the product of following reaction:

14. Find the correct product of following reaction:

H₃C—CH=CH—CD₂—C—OH
$$\stackrel{\Delta}{\longrightarrow}$$
(a) H₃C—CH=CD₂ (b) CH₃—CH=CH—CHD₂
(c) H₃C—C=CH₂ (d) None of these

15.
$$COOH \xrightarrow{\Delta}$$

Passage-6

An optically active ester 'F' have molecular weight 186. Hydrolysis of 'F' gives two optically active compounds 'G' and 'H'. 'G' which is soluble in NaOH and 'H'. 'H' gives a positive iodoform test and on warming with conc. H_2SO_4 gives 'I' with no diastereomers. When Ag salt of 'G' reacted with Br_2 , racemic mixture 'J' is formed. Optically active 'J' is formed when 'H' is treated with TsCl and then with NaBr.

16. Find out structure of F:

(a)
$$C \rightarrow CH \rightarrow CH$$

(b) $C \rightarrow CH$
(c) $C \rightarrow CH$
(d) $C \rightarrow CH$

17. Find out correct structure of *I*:

18. What would be the structure of F if H gives negative iodoform test?

$$(a) \downarrow O \qquad \qquad (b) \uparrow O \qquad \qquad (d) \downarrow O \qquad \qquad (d)$$

Passage-7

$$A + A \xrightarrow{O} \xrightarrow{H_3O} B(C_8H_{10}O)$$



$$B + PBr_{3} \longrightarrow C$$

$$C + NaCN \longrightarrow D$$

$$D + H_{2}SO_{4} \stackrel{\Delta}{\longrightarrow} E (C_{9}H_{10}O_{2})$$

$$E + SOCl_{2} \longrightarrow F$$

$$F + AlCl_{3} \longrightarrow G$$

$$G \xrightarrow{LiAlH_{4}} H \xrightarrow{H_{2}SO_{4}} I$$

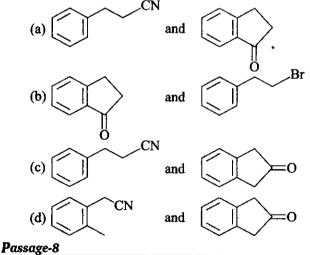
19. Find out structure of I:



20. The compound (F) must be:

(a)
$$Cl$$
 (b) Cl (c) Cl (d)

21. The compounds D and F must be:



The Hunsdiecker reaction is believed to proceed by a free radical mechanism and involves the formation of an acyl hypohalite.

O O
$$\parallel$$
 A. R —C—O—Ag +Br₂ \longrightarrow R —C—O—Br +AgBr

B.
$$R - C - O - Br \longrightarrow R - C - O + Br$$

O

C. $R - C - O \longrightarrow R^{\bullet} + CO_{2}$

O

D. $R \cdot + R - C - OBr \longrightarrow R - Br + R - C - O^{\bullet}$

O

CH₃

Product

CH₃

The major product is:

$$\begin{array}{c} & \text{Br} \\ | \\ \text{(b) Ph---CH---CH} = \text{CH---CH}_3 \\ & \text{Br} \\ | \\ \text{(c) Ph----CH} = \text{C} - \text{---CH}_2 - \text{---CH}_3 \\ \end{array}$$

24. The rate determining step is:

(a) Step I

(b) Step II

(c) Step III

(d) Step IV

Passage 9

25. Find out correct combination of 'A':

(a)
$$C_2H_5$$
 $\stackrel{\circ}{O}$, CI — C — OC_2H_5

- (b) $C_2H_5\overset{\Theta}{O}, CH_3 C CI$
- (c) $C_2H_5 \stackrel{\Theta}{O}, CH_3 \stackrel{||}{-}C \stackrel{||}{-}OC_2H_5$ (d) $H^{\oplus}/H_2O, CH_3 \stackrel{||}{-}C \stackrel{||}{-}OC_2H_5$

26. Identify 'C':

- (a) $C_2H_5 \overset{\ominus}{O}, CH_3CH_2$ —I (c) $\bigwedge MgBr, H^{\oplus}/H_2O$
- (b) H[⊕]/H₂O, Δ
 - (d) None of these
- 27. Name of the reaction which converts F into G:
 - (a) Cannizzaro reaction
- (b) Claisen condensation

(c) Aldol condensation

(d) Reformatsky reaction

EXERCISE-4 MATRIX MATCH TYPE



1. Column (I)

Column (II)

(a) HOOC—COOH
$$\stackrel{\triangle}{\longrightarrow}$$
 Ph

P. Diastereomers

(b)
$$\begin{array}{c} COOH \\ D \longrightarrow H \\ H_3C \longrightarrow H \end{array} \xrightarrow{\begin{array}{c} 1. \text{ AgOH/}\Delta \\ \hline 2. \text{ Br}_2/\text{CCl}_4 \end{array}}$$

O. Racemic mixture

(c) HOOC
$$\xrightarrow{\text{CH}_3}$$
 COOH $\xrightarrow{\Delta}$

R. Optically active

(d) Ph—C—CD— C—OH
$$\stackrel{\Delta}{\longrightarrow}$$
 O CH₃ O

S. CO₂ will evolve

Column (II)

P. Cyclic

2. Column (I)

OH

(a) Ph—CH—COOH
$$\stackrel{\Delta}{\longrightarrow}$$

OH

- (b) Ph—CH—CH₂—COOH $\stackrel{\Delta}{\longrightarrow}$
- Q. Exhibit geometrical isomerism
- (c) Ph—CH2—CH2—COOH $\stackrel{\Delta}{\longrightarrow}$ R. Can be optically active OH
- (d) $HO CH_2 COOH \xrightarrow{\Delta}$
- S. Lactone

3. Column (I)

Column (II)

(a)
$$H_3C$$
— C — O — CH_2CH_3 $\xrightarrow{H^{\oplus}/H_2O}$

- P. Bimolecular
- Q. Unimolecular
- $-C \longrightarrow CH_3 \xrightarrow{H^{\oplus}/H_2O}$ Ρh
- R. Alkyl cleavage
- (d) CH_3CH_2 —C—O— CH_3 \longrightarrow
- S. Acyl cleavage Column (II)

4. Column (I)

(a) Ph—C— NH_2 — \rightarrow Ph— CH_2OH $P. B_2H_6$, AcOH, H_2O

$$(b) \xrightarrow{O} \xrightarrow{HO} \xrightarrow{OH} Ph$$

Q. LiAlH₄

- (c) Ph---CH---COOH
- $R. H_2, Pd-BaSO_4$

S. None of these

Column (II)

- 5. Column (I)
 - (a) $C_2H_5O^{\ominus}$ OH

P. Hydrolysis

(b) OH C_2H_5OH/H^{\oplus}

Q. Esterification

(c) $O \longrightarrow H_3^{\oplus}O$

R. Saponification

(d) O OH

S. Acid Base reaction

6. Column (I)

(a) -C -OH \longrightarrow $-CH_2OH$

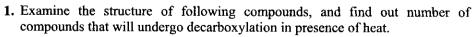
Column (II)

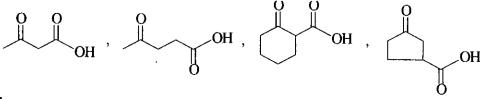
- Q. NaBH₄

P. LiAlH₄

- $(c) \longrightarrow C \longrightarrow CH_2OH$
- $R. B_2 H_6 / THF$
- $S. H_2/Pd$

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS





2. How many moles of NaOH would be required for complete neutralization of following compounds.

3. How many moles of CO₂ will released when following compound treated with heat.

4. Examine the structural formulas of following compounds and find out how many compounds can show Claisen condensation reaction.

$$OC_2H_5$$
, $H-C-OC_2H_5$, OC_2H_5 , OC_2H

At what value of 'n' the formation of six membered ring take place.

6.
$$O \xrightarrow{(X'CH_3MgBr)} HO$$
 OH, Find out value of 'X'.

7.
$$CH_3$$
— C — $OC_2H_5 + CH_3CH_2$ — C — OC_2H_5 $\xrightarrow{C_2H_5ON_a^{\oplus}}$ $\xrightarrow{C_2H_5OH}$

How many different condensation products would be form by above reaction.

8. How many of following esters show A_{AL}-1 hydrolysis (Acid catalyzed, unimolecular and alkyl-oxygen fission ester hydrolysis)

♦

ANSWERS



Exercise-1: Only One Correct Answer

Level-1			<u> </u>															
1. (c)	2. (c)	3. (b)	4.	(c)	5.	(c)	6.	(d)	7.	(b)	8.	(d)	9.	(d)	10.	(a)
.11. (d)	12. (b) :	13. (d)	14.	(a)	15.	(c)	16.	(d)	17.	(a)	18.	(p)	19.	(c)	20.	(c)
21. (b)	22. (c) :	23. ((c)	24.	(b)	25.	(a)	26.	(c)	27.	(d)	28.	(a)	29.	(c)	30.	(a)
31 . (d)	32. (a)	33. (b)	34.	(b)	35.	(c)	36.	(c)	37.	(d)	38.	(c)	39.	(a)	40.	(b)
41 . (c)	, 42. (b)	43. ((c)	44.	(b)	45.	(d)	46.	(b)	47.	(a)	48.	(d)	49.	(c)	50.	(b)
Level-2								,	<u></u>				··					
1,^ (c)	2. (b)	' 3. ((a)	4.	(c)	5.	(b)	6.	(c)	7.	(b)	8.	(c)	9.	(a)	10.	(c)
11. (b)	12. (c)	13. ((c)	14.	(a)	15.	(a)	16.	(c)	17.	(b)	18.	(b)	19.	(b)	20.	(c)
21. (b)	22. (a) .	23. (d)	24.	(c)	25.	(a)	26.	(d)	27 .	(b)	28.	(c)	29.	(a)	30.	(b)
31 . (c)	32, (b)	33. ((b)	34.	(a)	35.	(b)	36.	(d)	37.	(c)	38.	(b)	39.	(a)	40.	(c)
41. (a)	42. (d)	43. ((b)	44.	(c)	45.	(c)	46.	(c)	47.	(b)	48,	(b)	49.	(a)	50.	(b)
51 . (c)	52. ((c)	53. ((d)	54.	(a)	55.	(d)	56.	(d)	57 .	(a)	58,	(d)	59.	(c)	60.	(c)
61. (c)	62 . (b)	63. ((c)	64.	(b)	65.	(b)	6 6.	(a)	67.	(b)	68.	(c)	69.	(a)	70.	(d)
71. (b)	72. (b)	73. ((a)	74.	(c)	75.	(d)	76.	(a)	77.	(c)	78.	(a)	79.	(b)	80.	(d)
81. (c)	82. (b)	83. ((a)	84.	(b)				(a)	87.	(c)	88.	(b)	89.	(d)	90.	(b)
91. (c)	92. (97.					(b)	100.	(a)
101: (c)	•															(a)	110.	(d)
111 . (a)																		

Exercise-2: More Than One Correct Answers

	45 ->		()		/h ^\	<u> </u>	(b, d)		(a, b, d)	6	(a c d)
	(b, c)	Z.	(a, c)	э.	(b, c)	٠٠.	(D, D)	J.			
7.	(a, c)	8.	(a, b, c)	9.	(c, d)	10.	(a, c, d)	11.	(a, c)	12.	(c, d)
13.	(a, c)	14.	(b. d)	15.	(b, c, d)	16.	(a, d)	17.	(a, b, c, d)	18.	(a, b, d)
19.	(a, c, d)	20.	(a, b, d)	21.	(b, c)	22.	(a, b, c)	23.	(a, b, c, d)	24.	(a, b, d)
25.	(a, b, c, d)	26.	(a, b, c)	27.	(a, b, c)	28.	(b, c, d)	29.	(b, d)	30.	(b, c, d)
31.	(c, d)	32.	(a, c, d)	33.	(a, b)	34.	(b, c)	35.	(a, b)	36.	(a, b, c)
37,	(b, c)	38.	(a, b, d)	39.	(a, b, c)	40.	(a, b, c)	41.	(c, d)	42,	(b, c)
43.		44.	(a, b, c)	45.	(a, b, d)	46.	(b, c, d)	47.	(a, b, c)	48.	(a, b, d)
49.	(a, b, c)	50.	(a, b, c)								

Exercise-3: Linked Comprehension Type

, 1 . (c)	2. (b)	3. (b)	4 . (a)	5 . (c)	6 . (d)	7. (b)	8. (c)	9 . (b)	10 . (b)
,1. (c) 11. (b)	12. (d)	13. (a)	14. (a)	15. (c)	16 . (a)	17. (b)	18. (d)	19. (c)	20. (b)
21. (a)	22. (b)	23. (c)	24 . (d)	25. (a)	26 . (b)	27. (c)			

Exercise-4: Matrix Match Type

<u> </u>	aton type			
1. (a) \rightarrow P, R, S;	(b) $\rightarrow P, R, S$;	$(c) \rightarrow Q, S;$	(d) → Q, S	
2. (a) $\rightarrow P$, Q , R ;	(b) $\rightarrow Q$;	(c) $\rightarrow P, R, S$;	$(d) \rightarrow P$	
3. (a) → P, S;	(b) $\rightarrow Q,R$;	(c) → Q, S;	$(d) \rightarrow P, S$	Į
4. (a) → S;	(b) $\rightarrow Q$;	$(c) \rightarrow S$;	(d) $\rightarrow R$	
5. (a) → S;	(b) $\rightarrow Q$;	(c) $\rightarrow P$;	(d) $\rightarrow R$	}
6. (a) $\rightarrow P.R.S$:	$(b) \rightarrow P, O, S'$	$(c) \rightarrow P R S$	$(d) \rightarrow P R S$	

Exercise-5: Integer Answer Type Problems

t. 751	2 (4)	3. (4)	4 (3)	5 (3)	6 (2)	7 (4)	P /2\	



Amines

P ...

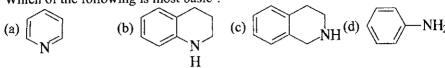
EXERGISE() ONLY ONE CORRECT ANSWER



1. Acetamide is treated separately with t give methylamine?	the following reagents. Which one of these
(a) PCI ₅	(b) Sodalime
(c) NaOH + Br ₂	(d) Hot concentrated H ₂ SO ₄
	of Br ₂ and KOH gives RNH ₂ as the main
product. The intermediates involved i	
•	h mo receiver are .
O (a) <i>R</i> ——C——NHBr	
(a) \hat{R} —C—NHBr	(b) R—NHBr
	O H Br
(c) $R - N = C = 0$	(d) R - C - N Br
(c) X N C O	Br
3. Which is the best method of preparing	
(a) $CH_3CI + NH_3 \longrightarrow$	(b) $CH_3CI \xrightarrow{KCN} \xrightarrow{Sn/HCI}$
• • • • • • • • • • • • • • • • • • • •	CHCl ₃ /KOH Sn/HCl
(c) $CH_3Cl \xrightarrow{AgCN} \xrightarrow{LiAlH_4}$	(d) $CH_3NH_2 \xrightarrow{CHCl_3/KOH} \xrightarrow{Sn/HCl}$
4. Ethyl cyanide (A) can be converted to	ethyl amine (B) by:
	(b) $A \xrightarrow{\text{H}_3\text{O}^+} \xrightarrow{\text{NH}_3/\Delta} \xrightarrow{\text{KBrO}/\Delta} B$
(a) $A \xrightarrow{Sn/HCl} B$ (c) $A \xrightarrow{LiAlH_4} B$	$(b) A \longrightarrow \longrightarrow B$
(c) $A \xrightarrow{\text{LIAIH}_4} B$	(d) both (a), (c) are correct
5. In Gabriel synthesis, amine is always	
(a) aliphatic primary amine	(b) aliphatic secondary amine
(c) aromatic primary amine	(d) aromatic secondary amine
6. In Gabriel synthesis, halide may be:	
(a) benzyl halide	(b) allyl halide
(c) both (a) and (b)	(d) tertiary alkyl halide
7. In the given reaction sequence C ₆	$H_5 - CH_2 - NH_2 \xrightarrow{CHCl_3/Alc. KOH} [X]$
$\xrightarrow{\text{H}_2\text{O/NaOH}} [Y]. [Y] \text{ will be} :$	

(a) C_6H_5 —CN (a) $C_6H_5 - CN$ (c) $C_6H_5 - CH_2 - NH_2$ (b) C₆H₅NC (d) C_6H_5 — CH_2OH 8. Predict the nature of the product $PC_6H_5CONH_2 \xrightarrow{Br_2/OD^-} P$ (a) $C_6H_5NH_2$ (b) C6H5NHD (c) $C_6H_5ND_2$ (d) All of these 9. Which of the following statements is not correct? (a) Aliphatic amines are stronger bases than ammonia. (b) Aromatic amines are stronger bases than ammonia. (c) The alkyl group in alkyl ammonium ion more stabilizes the ion relative to the (d) The aryl group in aryl ammonium ion less stabilizes the ion relative to the amine. 10. The correct sequence regarding base strength of aliphatic amines in aqueous solution is: (a) $R_3N > R_2NH > RNH_2 > NH_3$ (b) $R_2NH > RNH_2 > R_3N > NH_3$ (c) $R_2NH > R_3N > RNH_2 > NH_3$ (d) $RNH_2 > R_2NH > R_3N > NH_3$ 11. Decreasing order of basicity of the three isomers of nitro aniline is: (a) p- nitroaniline > o- nitroaniline > m- nitroaniline (b) p-nitroaniline > m-nitroaniline > o-nitroaniline (c) m- nitroaniline > p- nitroaniline > o- nitroaniline (d) m-nitroaniline > o-nitroaniline > p-nitroaniline 12. Strongest base is: NH_2 (a) NH₂CNH₂ 13. Which is the best leaving group? (a) N₂ (c) NH₂ (d) CH₃COO[~] 14. Which is most volatile? (a) CH₃CH₂CH₂NH₂ (b) $(CH_3)_3 N$ CH₃CH₂ (c) (d) CH₂OH 15. Which one of the following is used as phase transfer catalyst? (a) Primary amine (b) Quaternary ammonium salt (c) Tertiary nitroalkane (d) Tertiary amine

16. Which of the following is most basic?



17. Predict about the relative boiling point of the following two amines.



- (a) Boiling point of I > II
- (b) Boiling point of II > I
- (c) Both should have equal boiling points
- (d) It can't be predicted
- 18. Carbylamine test is performed in alcoholic KOH by heating a mixture of:
 - (a) chloroform and silver powder
 - (b) trihalogenated methane and a primary amine
 - (c) an alkyl halide and a primary amine
 - (d) an alkyl cyanide and a primary amine
- 19. Which of the following statements is not correct?
 - (a) Replacement of halogen by NH₂ in alkyl halide is a nucleophilic substitution reaction
 - (b) Aryl halideds show more reactivity as compared to alkyl halides in the replacements of halogen by the NH₂ group
 - (c) During the replacement of halogen by —NH₂ group, ammonia is taken in large excess so as to avoid the formation of 20 and 30 amines
 - (d) Tertiary alkyl halide generally produces alkene instead of the replacement of halogen by NH₂ group
- 20. Which of the following statements is not correct?
 - (a) Primary amines show intermolecular hydrogen bonding.
 - (b) Secondary amines show intermolecular hydrogen bonding.
 - (c) Tertiary amines show intermolecular hydrogen bonding.
 - (d) Amines have lower boiling points as compared to those of alcohols and carboxylic acids of comparable molar masses.
- 21. Which of the following amines from N—nitroso derivative when treated with NaNO₂ and HCl?

(a)
$$CH_3NH_2$$
 (b) NH_2

(c) NH_2

(d) R

- 22. Hinsberg's reagent is:
 - (a) phenylisocyanide
 - (c) p-toluenesulphonic acid
- (b) benzensulphonyl chloride
- (d) o-dichlorobenzene

23. Thermal decomposition of $\stackrel{\oplus}{N}$ Me $_3$ OH $^-$ gives :

(a)
$$\sqrt{}$$
 NMe₃ + MeOH

(b)
$$\sim$$
 NMe₂ + MeOH

(c)
$$\langle _ \rangle$$
 - NMe₂ + CH₂

(d) no reaction

24.
$$CH_2 \stackrel{1}{\stackrel{\wedge}{\text{N}}} (CH_3)_2 \stackrel{\Delta}{\longrightarrow} CH_2 + (CH_3)_2 \text{ NOH. This is called :}$$

- (a) Hofmann elimination
- (c) Saytzeff reaction
- (b) Cope reaction(d) Carbyl amine reaction

- 25. Cope reaction is:
 - (a) $S_N 1$ intramolecular

(b) S_{N2} intramolecular

(c) E_1 intramolecular

- (d) E_2 intramolecular
- 26. Which of the following is Hofmann mustard oil reaction?
 - (a) Reaction of primary amine with CHCl₃
 - (b) Reaction of primary amine with CHCl₃ + KOH
 - (c) Reaction of primary amine with CS₂ + HgCl₂
 - (d) Reaction of aromatic amine with iodoform

27.
$$C_4H_{11}N + HNO_2 \longrightarrow C_4H_{10}O$$
, X will give:

- (a) Carbyl amine reaction
- (b) Hofmann mustard oil reaction
- (c) Diazonium salt (as the intermediate) with HNO2
- (d) None of the above
- 28. In the Hofmann-Bromamide rearrangement intermediate compounds are:

(b)
$$\begin{bmatrix} O \\ || \\ R - C - \overline{N} - Br \end{bmatrix} Na^{+}$$

(c)
$$R - N = C = O$$

- (d) all of these
- 29. Which one of the following amines will not give benzoylation reaction?

(a)
$$C_6H_5$$
— NH_2

(d)
$$C_6H_5$$
—NH—CH₃

30. Which of the following compounds can from alcohol with NaNO₂/HCl?

$$(a) \begin{array}{c} H_3C \\ \hline \\ H_3C \\ CH_3 \end{array}$$

- (c) $CH_3 CH_2 NH_2$
- (d) All of these

31. Which of the following will not react with CS₂?

(a) C_6H_5 — NH_2

(b) CH₅—NH—CH₃

32. In the given reaction $CH_3 - CH_2 - NH - CH_2 - CH_2 - CH_2$

- (i) CH_3I (excess) [X] is the major product; [X] will be:
- (a) $CH_2 = CH_2$

- (b) $CH_2 = CHCl$
- (c) 1:1 ratio of (a) and (b)
- (d) $CH_3 CH_2 CI$

33. Predict the nature of P in the following reaction.

 $Me_3CCH_2NH_2 \xrightarrow{HONO} P$ (main product)

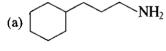
(a) Me₃CCH₂OH

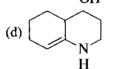
(b) $Me_2CCH = CH_2$

(c) $Me_2C(OH)C_2H_5$

(d) Me₃CCH₂NH(NO)

 $\xrightarrow{\text{H}_2/\text{Ni}} X$. Here X is: 34.

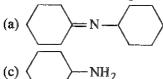




 $\xrightarrow{\text{aq. NaNO}_2} P.P$ is:

(d) none of these

36. Which of the following is an enamine?



37. Which of the following amines will react with cyclohexanone to give enamine?

(a) CH₃NH₂

(b) (CH₃)₂NH

38. The intermediates obtained in the reaction $R \xrightarrow{\text{NaN}_3} R \longrightarrow \text{NH}_2 \text{ are}$:

(a)
$$R - C - N - N \equiv N$$

(b)
$$R - N = C = 0$$

39. Compound $[X]C_4H_{11}N$ reacts with p-toluene sulphonyl chloride in aqueous NaOH to give a solid. The compound [X] is:

(a)
$$CH_3 - CH_2 - CH_2 - CH_2 - NH_2$$

(c)
$$CH_3CH_2$$
— NH — CH_2 — CH_3

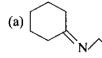
40. Cyclohexanol can be converted into cyclohexylamine by following two routes. Which of he following methods is expected to give good yield of cyclohexylamine?

- (c) both are equally suitable
- (d) neither of the two

- 41. Which of the following will give unsymmetrical di-substituted urea after reaction with CH₃NH₂?
 - (a) COCl₂
- (b) CH₃CH₂NCS (c) CH₃CH₂NCO (d) all of these



1. Which of the following compounds is an amine?







2. Which of following compounds exists as non-resolvable racemic mixture?









3. Which of the following compounds loses optical activity due to pyramidal inversion?





- - The final product (B) is:





(d)
$$\wedge_{NH_2}$$

5.
$$\underbrace{N - H \xrightarrow{1. \text{ KNH}_2, \text{ DMF}}}_{\text{O}} A \xrightarrow{1. \text{ KOH, } \Delta}_{\text{Q}} B$$

The end product B of the above reaction is:

(a)
$$Ph$$
 NH_2 (b) Ph $N-H$ (c) Ph N Ph H H

6.
$$CH_3CH_2Br \xrightarrow{AgCN} A \xrightarrow{NaOH, \Delta} B$$
; (B) is:

(a) CH₃CH₂NHCH₃

(b) CH₃CH₂CH₂NH₂

(c) CH₃CH₂NH₂

(d) _N _H

7.
$$\underbrace{\overset{\text{NH}_2}{\longrightarrow} X \xrightarrow{\text{LiAlH}_4} Y; (Y) \text{ is :}}_{}$$

- (a) Ph—N—CH₃
- (b) Ph—CH₂—NH₂
- O || (c) Ph—N—C—H

- (d) $Ph \stackrel{\oplus}{N} \stackrel{\ominus}{=} \stackrel{\ominus}{C}$
- 8. The major product formed in the reaction:

$$\begin{array}{c}
O \\
+ O \\
N
\end{array}
\xrightarrow{p\text{-TsOH (Trace)}}$$

$$\begin{array}{c}
C_6H_6, \Delta
\end{array}$$

(c)
$$N O$$

9.
$$C = CH \xrightarrow{B_2H_6} X \xrightarrow{CH_3NH_2} Y$$

The final product (Y) is:

(a)
$$Ph$$

N

(b) Ph

N

(c) Ph

N

(d) Ph

N

10. Among the following compounds which one will produce a Schiff base on reaction with cyclopentanone?

(a)
$$\langle N \rangle$$
 (b) $\langle N \rangle$ $\langle CH_3 \rangle$ (c) $\langle N \rangle$ $\langle CH_3 \rangle$ $\langle CH_3 \rangle$

- 11. In which of the following reactions does the amine behaves as an acid?
 - (a) $(C_2H_5)_2NH + H_2PtCl_6$
- (b) $CH_3NH_2 + H_2O$
- (c) $(Me_2CH)_2NH + n C_4H_9Li$
- (d) $(C_2H_5)_3 N + BF_3$
- 12. Consider the following sequence of reactions:

$$\begin{array}{c|c}
O \\
+ & \swarrow \\
N \\
- & A
\end{array}
\xrightarrow{\begin{array}{c}
CCl_4 \\
\Delta
\end{array}} A \xrightarrow{\begin{array}{c}
1. \ CH_2 = CH - CH_2Br \\
2. \ H_3O, \Delta
\end{array}} B$$

The end product (B) is:

(a)
$$O$$
 (b) O (c) OH (d) OH

13. Consider the following sequence of reactions:

$$H_2C = CH - CH = CH_2 \xrightarrow{Br_2 (1 \text{ Mole})} A \xrightarrow{1. \text{ KCN (excess)}} B$$

The end product (B) is:

- (a) $H_2N (CH_2)_2 CH = CH (CH_2)_2 NH_2$ (b) $H_2N (CH_2)_3 NH_2$
- (b) $H_2N (CH_2)_6 NH_2$
- (c) $NC-CH_2-CH = CH-CH_2-CN$

(d)
$$H_2C = CH - CH - (CH_2)_2 - NH_2$$

 NH_2

The major product (B) is:

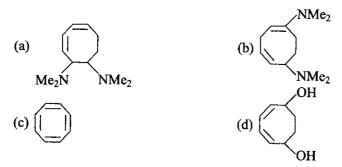
(a)
$$CH_3$$
— CH_2 — $CH=CH_2$ (b) CH_3 — CH_2 — $CH=CH_3$ CH_3

(c)
$$H_3C$$
— CH = CH — CH_3

(d)
$$H_3C$$
— CH_2 — CH — N
 CH_3
 CH_3
 CH_3

15.
$$\underbrace{\begin{array}{c} 1. \text{ Br}_2 \text{ (1 Mole), CCl}_4 \\ \hline 2. \text{ (CH}_3)_2\text{NH (excess)} \end{array}}_{2. \text{ AgOH, } \Delta} A \xrightarrow{1. \text{ CH}_3\text{I (excess)}}_{2. \text{ AgOH, } \Delta} B \text{ (Major product)}$$

The major product (B) is:



16. Consider the following sequence of reactions:

HO—C—C—C
$$=$$
 N $\xrightarrow{200^{\circ}\text{C}}$ A $\xrightarrow{\text{LiAlH}_4}$ B; (B) is:

(a) N—H

(b) O

H NH₂

(c) HO—H₂C—C—CH₂—NH₂

(d) $\xrightarrow{\text{H}_3\text{C}}$ CH—CH₂—NH₂

17. The major product (X) of the reaction is:

$$O_2N \xrightarrow{OCH_3} \xrightarrow{H_2, N_i} X$$

$$\text{(d)} \nearrow \bigvee_{\substack{N \\ H}} \ \ ^{\downarrow}$$

18. Which of the following compounds does not liberate N₂ on treatment with HNO₂?

$$\begin{array}{c} \text{O} \quad \cdot \\ \parallel \\ \text{(b)} \ \text{H}_2\text{N}\text{--}\text{C}\text{--}\text{NH}_2 \end{array}$$

(c)
$$\rightarrow NH_2$$

- 19. The product formed in the reaction is:

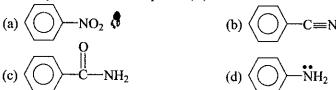
20. The major product (B) formed in the reaction sequence is:

$$\begin{array}{c}
O \\
\hline
Ph - C - Cl \\
\hline
dil. NaOH
\end{array}$$

$$A \xrightarrow{1. CH_3MgBr} B$$

$$2. H_3^{\oplus}O$$

21. An organic compound (A) on reduction gives a compound (B) which on reaction with CHCl₃ and NaOH form (C). The compound (C) on catalytic reduction gives N-methylaniline. The compound (A) is:



22. The major end product (B) of the reaction:

The Higher end product (B) of the reaction:

$$\frac{\text{HCl}}{\text{ZnCl}_2} A \xrightarrow{\text{1. NaCN (excess)}} B$$
(a) HO

Cl

(b) NC

(c) H₂N

NH₂

23. Which one among the following is expected to form a secondary alcohol on treatment with HNO₂?

(a)
$$NH_2$$
 (b) NH_2 (c) NH_2 (d) $N-H$

24. The end product (B) of the reaction sequence:

$$C_{2}H_{5} \longrightarrow N \longrightarrow CH_{3} \xrightarrow{Ph \longrightarrow C \longrightarrow Cl} \xrightarrow{LiAlH_{4}} B$$

$$C_{2}H_{5} \longrightarrow N \longrightarrow CH_{3} \qquad (b) Ph \longrightarrow CH_{2} \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow CH_{3} \qquad (c) Ph \longrightarrow CH \longrightarrow CH_{3} \qquad (d) Ph \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow CH_{3} \qquad (d) Ph \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow CH_{3} \qquad (d) Ph \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow N \longrightarrow CH_{3} \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow N \longrightarrow N$$

$$C_{2}H_{5} \longrightarrow N$$

$$C_{3}H_{5} \longrightarrow N$$

$$C_{4}H_{5} \longrightarrow N$$

$$C_{4}H_{5} \longrightarrow N$$

$$C_{4}H_{5} \longrightarrow N$$

$$C_{5}H_{5} \longrightarrow N$$

$$C_{5}H_{5} \longrightarrow N$$

The product of above reaction is:

(a)
$$N$$
—Br (b) N —O (c) N H₂ N H₂ (d) N H₂ N H₂

26. The major product (X) of the reaction is:

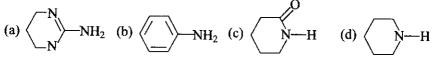
27. The major product of the reaction is:

28. The reaction of p-aminophenol with one mole of acetyl chloride in presence of pyridine gives:

29. The major product (X) formed in the reaction :

COOH
$$\begin{array}{c}
 & 1. \text{ N}_3\text{H}, \text{ H}_2\text{SO}_4 \\
\hline
 & 2. \text{ H}_3\text{O}^{\oplus}, \Delta
\end{array}$$

30. Which of the following is the strongest Bronsted acid?



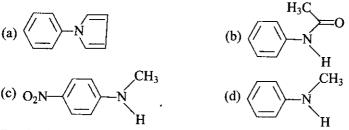
31. Which of the following is the strongest Bronsted base?

(a)
$$\langle N \rangle$$
 NH₂ (b) $\langle N \rangle$ NH₂ (c) $\langle N \rangle$ H (d) $\langle N \rangle$ NH₂

32. Which of the following is the weakest Bronsted base?



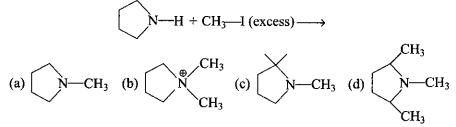
33. Which of the following is strongest Bronsted base?



34. For the following compounds, which is the strongest base and which is strongest acid?

$$\begin{array}{c|cccc}
O & & & & & & & & & & & & \\
\hline
N & & & & & & & & & & & \\
N & & & & & & & & & \\
\hline
I & & II & & III & & & IV
\end{array}$$

- (a) II = Strongest base, I = Strongest acid
- (b) IV = Strongest base, III = Strongest acid
- (c) III = Strongest base, IV = Strongest acid
- (d) II = Strongest base, III Strongest acid
- 35. Which compound is the likely product from following reaction?



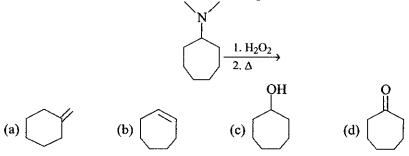
36. Which of these is the strongest base?

(a)
$$Et$$
 (b) N (c) $N \times (d)$ $N \times (d)$ $N \times (d)$

37. What sequence of reaction would best accomplish the following reaction?

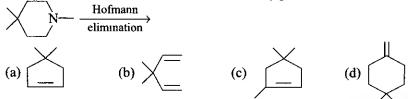
$$C \equiv N \xrightarrow{?} CH_2$$

- (a) LiAlH₄, 3CH₃I/AgOH, Δ
- (b) LiAlH₄, P_2O_5/Δ
- (c) 20% H_2SO_4/Δ , P_2O_5/Δ
- (d) H₂, Pd BaSO₄
- 38. What is the likely product from the following reaction?



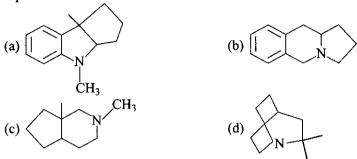
39. Repeated Hofmann elimination reaction (exhaustive methylation followed by heating with AgOH) will often remove a nitrogen atom from an amine molecule.

Which of the following compounds is the likely product in this case?



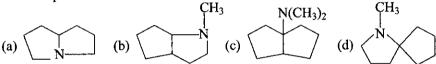


40. Only one of the following amines will lose its nitrogen atom as trimethyl amine by repeated Hofmann elimination reactions:

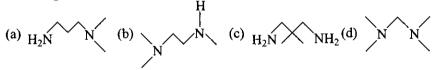


41. The nitrogen atom in each of the following tertiary amines may be removed as trimethyl amine by repeated Hofmann elimination.

Which of the following amines requires the greater number of Hofmann sequence to accomplish this?



42. The Hinsberg test of a C₅H₁₄N₂ compound produces a solid that is insoluble in 10% aq. NaOH. This solid derivative dissolves in 10% aq. H₂SO₄. Which of the following would best fit these facts?



- 43. What set of conditions would be useful for preparing a 2° amine?
 - (a) $2^{\circ} R$ —Br + NaNH₂

(b) $2^{\circ} R$ —Br + NaN₃, H₂/Pt

(c)
$$1^{\circ}R$$
—NH₂ + $1^{\circ}R$ CHO, H₂ and Pt (d) $1^{\circ}R$ —Br $\stackrel{\bigcirc}{\bigcirc}$ N $^{\ominus}$, H₃O/ $\stackrel{\triangle}{\bigcirc}$

44. Which of the following amines reacts most rapidly with

45. Consider the following sequence of reactions;

$$NH_2 \xrightarrow{Br_2 + KOH} A \xrightarrow{CH_3I \text{ (excess)}} B \xrightarrow{AgOH} C$$

Identify product C:

46. The major product formed in the following reaction is:

$$H_3C$$
 CD_3
 H_3C
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CH_3
 CCH_3
 CD_3
 CCH_3
 CCH_3

47. The product formed in the reaction is:

$$(a) \qquad \begin{array}{c} O \\ NH_2 + Br_2 \xrightarrow{CH_3O^{\Theta}Na^{\oplus}} \\ CH_3OH \\ NH - C \longrightarrow OCH_3 \\ (b) \qquad \qquad \\ NH - C \longrightarrow OCH_3 \\ (c) \qquad \qquad \\ (d) \qquad \qquad \\ CH_3 \end{array}$$

48.
$$(NH_2)$$
 (NH_2) (NH_2)

Identify B:

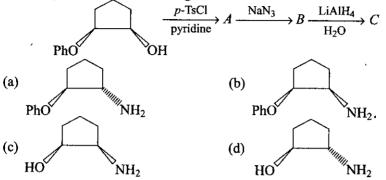
The final product (B) is:

(a)
$$CN$$
 (b) CH_2 $C-NH_2$ (c) $N-H$ CN

50. The final major product of the reaction is:

51. The major product of the reaction:

52. The end product of the following reaction is:



53. Consider the following sequence of reactions:

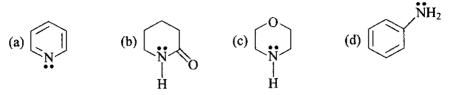
$$N-H \xrightarrow{1. \text{ KOH}} A \xrightarrow{NH_2-NH_2} B + C$$

The products (B) and (C) are:

(a)
$$N-H + NH_2-CH_2-CH_2-Br$$

 $N-H + NH_2-CH_2-CH_2-F$
(b) $N-H + NH_2-CH_2-CH_2-F$
(c) $NH_2 + NH_2-CH_2-CH_2-F$
 $NH_2 + NH_2-CH_2-CH_2-F$

54. Which of the following compounds will react with cyclopentanone to form an enamine?



55. Predict the major product X in the following reaction:

$$(a) \qquad (b) \qquad (c) \qquad (d) \qquad (d) \qquad (d)$$

56. NH_2 $\xrightarrow{NaNO_2}$ $\xrightarrow{H_2SO_4}$ (A); Product of this reaction is:

57. HO $A \longrightarrow A \longrightarrow B$; Compound B is:

(a)
$$NH$$
— C — H (b) C — NH

(c) C — NH — C H₃

(d) HO
 NH_2
 $NaOBr$

58.
$$(X)$$
; Product (X) is:

59.
$$H \xrightarrow{\text{Ca(OH)}_2 + \text{Br}_2} (X)$$
; Product (X) is:

60.
$$H_3C$$
 \xrightarrow{Ph} O \xrightarrow{KOBr} (Y) ; Product (Y) of the reaction:

(a)
$$H_3C$$
 $\stackrel{Ph}{\longrightarrow} NH_2$ (b) H $\stackrel{Ph}{\longrightarrow} NH_2$ (c) Mixture of (a) and (b) H_3C $\stackrel{Ph}{\longrightarrow} O$

(d)
$$H^3C$$

62. Predict the product of following reaction:

$$N_{2} \underbrace{\begin{array}{c} CH_{3} \\ NH - Ts \end{array}}_{NH - Ts} \underbrace{\begin{array}{c} \Delta, CCl_{4} \\ Et_{3} \\ N \end{array}}_{}$$

Final product M is:

Final product 'O' is:

65. Consider the following diazonium ion:

$$Me_{2}N \xrightarrow{P} N_{2}^{\oplus} O_{2}N \xrightarrow{Q'} N_{2}^{\oplus}$$

$$MeO \xrightarrow{R'} N_{2}^{\oplus} H_{3}C \xrightarrow{S'} N_{2}^{\oplus}$$

The order of reactivity towards diazo coupling with phenol in presence of dil. NaOH:

(a)
$$P > Q > R > S$$
 (b) $Q > S > R > P$ (c) $P > R > S > Q$ (d) $S > R > Q > P$

O

O

O

O

O

O

O

NH₂

O

O

A

Reaction II Ph—C—ND₂
$$\xrightarrow{\Theta}$$
 Br₂ \xrightarrow{B}

Products A and B are:

- (a) Ph—NH₂ and Ph—ND₂
- (b) Ph-ND₂ and Ph-NH₂

(c) Both Ph—NH₂

- (d) Both Ph—ND₂
- 67. An organic compound (A) C₉H₁₃N dissolves in dil. HCl and releases N₂ with HNO₂ giving an optically active alcohol. Alcohol on oxidation gives dicarboxylic acid, which on heating form anhydride. The organic compound 'A' is:

The final product is:

(b)
$$CH_3$$
 O NH_2 CH_3

69. Identify X in the following sequence of reaction:

$$\begin{array}{c}
 & \oplus \\
 & \text{N} = \text{NCl} \xrightarrow{\text{CuCN}} P \xrightarrow{\text{LialH}_4} Q \xrightarrow{\text{HNO}_2} X
\end{array}$$

(a) Benzoic acid

(b) Phenyl acetic acid

(c) Benzyl alcohol

- (d) Benzamide
- 70. Which sequence of steps will be able to produce 3, 3'-dinitro-biphenyl from benzene?
 - (a) HNO₃/H₂SO₄, Cl₂/FeCl₃, Na/ether
 - (b) Cl₂/FeCl₃, HNO₃/H₂SO₄, Na/ether
 - (c) Cl₂/FeCl₃, H₂SO₄, Na/ether
 - (d) I_2/HIO_3 , $Cl_2/FeCl_3$, $C_6H_5NO_2$

- 71. 1°, 2° and 3° nitroalkane can be identified by action of:
 - (a) $HNO_3 + NaOH$ (aq.)
- (b) CHCl₃ + NaOH (aq.)
- (c) $HNO_2 + NaOH$ (aq.)
- (d) CHCl₃ + KOH (alc.)
- 72. A compound 'X' when reacted with PCl₅ and then with NH₃ gives 'Y'. When 'Y' treated with Br₂ and KOH produced 'Z'. Z on treatment with NaNO₂ + HCl at 0°C and then boiling produced ortho-cresol. Compound 'X' is:
 - (a) o toluic acid

(b) o chlorotoluene

(c) o-bromotoluene

(d) m-toluic acid

73.
$$P \longrightarrow N = N \longrightarrow N = N \longrightarrow S$$

For such kind of diazo-coupling reaction the suitable substituents P and S are respectively:

(b)
$$-NO_2$$
 and $-C-H$

74.
$$CH_3 \xrightarrow{O_3} A \xrightarrow{\Delta} B + N \xrightarrow{N} OH$$

Identify 'B':

75. The final product B obtained in the reaction is:

$$\begin{array}{c}
\text{CH}_3\text{CH}_2\\
\text{CH}_3\text{CH}_2\\
\text{CH}_3\text{CH}_2
\end{array}$$

$$\begin{array}{c}
\text{H}_2\text{O}_2\\
\text{A} \xrightarrow{\Delta} B + \text{H}_2\text{C} = \text{CH}_2\\
\text{CH}_3\text{CH}_2$$

(b)
$$(H_2C-CH)_2$$

CH₃CH₂

(c)
$$H_3C--CH=-CH_2$$

Find out Y of the reaction:

(a)
$$\longrightarrow$$
 N—OH

(b) \longrightarrow N—OH

(c) \longrightarrow (d) \longrightarrow N=NO2 + HCl

(d) \longrightarrow NaNO2 + HCl

(d) \longrightarrow NaNO2 + HCl

(d) \longrightarrow NaNO2 + HCl

(e) \longrightarrow NaNO2 + HCl

(f) \longrightarrow NaNO2 + HCl

(g) \longrightarrow NaNO2 + HCl

(happed to the second to the

The compound C is:

OH
$$CH_2$$
— $CH=CH_2$

OH CH_2 — $CH=CH_2$

OH CH_2 — $CH=CH_2$

OH OH

(c) OH

(d) OH
 OH

The compound B is:

78.

79.
$$\underbrace{\begin{array}{c} \text{CH}_3\\ \text{NO}_2 \end{array}}_{\text{NO}_2} \xrightarrow{1. \text{ NaNO}_2 + \text{HCl}}$$

$$(a) \begin{picture}(20,10) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0$$

80. Identify the final product of following reaction:

$$(a) \qquad \begin{array}{c} \stackrel{\text{NaN}_3}{\longrightarrow} \stackrel{\text{H}_2, \text{ Pt}}{\longrightarrow} \\ \text{OH} \\ \text{(b)} \qquad OH \\ \text{NH}_2 \qquad (c) \qquad MH_2 \\ \text{NH}_2 \qquad NH_2 \\ \end{array}$$

81. Consider the following sequence of reaction:

$$O CH_3$$

$$O CH_3$$

$$O CH_3$$

$$O CH_3$$

$$O CH_3$$

The final product is:

O
The product can be given as:

82.

(a)
$$CH_2-NH_2$$
 (b) NH_2 (c) NH_2

83. In a set of reactions propionic acid yielded a compound D.

$$OH \xrightarrow{SOCl_2} B \xrightarrow{NH_3} C \xrightarrow{KOH} D$$

The structure of D would be:

(a)
$$\bigwedge_{H}^{CH_3}$$
 (b) \bigwedge_{NH_2} (c) $\bigwedge_{O}^{NH_2}$ (d) $\bigwedge_{O}^{NH_2}$

84. What would be the final product of reaction:

$$(a) \stackrel{Br}{\swarrow} + CH_3CH_2NH_2 \xrightarrow{NaOH}$$

$$(b) Br \stackrel{N}{\searrow}$$

$$CH_2CH_3$$

$$(c) \stackrel{N}{\swarrow}$$

$$(d) Br \stackrel{NH}{\swarrow}$$

85. Identify major product of following sequence of reaction:

$$(a) \qquad \stackrel{\text{NH}_2}{\longrightarrow} \qquad \stackrel{\text{CH}_3-C-Cl}{\longrightarrow} \qquad \stackrel{\text{CH}_3Cl}{\longrightarrow} \qquad \stackrel{\text{H}^{\oplus}/\text{H}_2O}{\longrightarrow} \qquad \stackrel{\text{NH}_2}{\longrightarrow} \qquad \stackrel{\text{NH}_2}{\longrightarrow} \qquad \stackrel{\text{CH}_3}{\longrightarrow} \qquad \stackrel{\text{NH}_2}{\longrightarrow} \qquad \stackrel{\text{NH$$

86. Identify the final product of following sequence of reaction:

$$(a) \begin{array}{c} \stackrel{N_2O_5}{\longrightarrow} \stackrel{Cl_2}{\longrightarrow} \stackrel{H_2}{\longrightarrow} \stackrel{NaNO_2}{\longrightarrow} \stackrel{H_2O}{\longrightarrow} \stackrel{\oplus}{\longrightarrow} \stackrel{\ominus}{\longrightarrow} \\ NO_2 & OH & Cl & N_2Cl \\ (b) & Cl & NH_2 & Cl \\ \end{array}$$

87. Identify the major product of following reaction:

$$\begin{array}{c|c} H_3C & \xrightarrow{CH_3} & \xrightarrow{\Theta} \\ & CH_3 & \xrightarrow{OH} \\ & & \\ N(CH_3)_3 & \\ & & \\ \end{array}$$

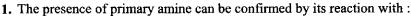
(a)
$$H_3C$$
 (b) CH_3 (c) CH_3 (d) none of these

88. Identify final product of following sequence of reaction:

89. What is the product of following reaction sequence:

$$(a) \qquad \begin{array}{c} \xrightarrow{\Delta} & \xrightarrow{CH_3-C-O-C-CH_3} & \xrightarrow{H^{\oplus}/H_2O} \\ & \xrightarrow{Benzene} & \xrightarrow{CH_3-C-O-C-CH_3} & \xrightarrow{H^{\oplus}/H_2O} \\ & \xrightarrow{O} & \xrightarrow{O} & \xrightarrow{O} & \xrightarrow{O} & \xrightarrow{O} & \xrightarrow{O} \\ & \xrightarrow{O} \\ & \xrightarrow{O} \\ & \xrightarrow{O} \\ & \xrightarrow{O} \\ & \xrightarrow{O} &$$

EXERCISE-2 MORE THAN ONE CORRECT ANSWERS



(a) HNO₂

(b) CHCl₃ + NaOH

(c) CS₂ and HgCl₂

(d) H_2SO_4

2. Which of the following reactions can be used to make ethyl isocyanide?

(a)
$$CH_3CH_2NH_2 + CHCl_3 \xrightarrow{KOH}$$
 (b) $CH_3CH_2Br + AgCN \xrightarrow{POCl_3}$ (c) $CH_3CH_2Br + KCN$

(c)
$$CH_3CH_2$$
— NH — C — H
 $\xrightarrow{POCl_3}$
(d) $CH_3CH_2Br + KCN$ \longrightarrow

3. By which of the following reactions can methylcyanide be prepared?

(a)
$$CH_3Br \xrightarrow{KCN} DMF$$

(b)
$$CH_3NH_2 + CHCl_3 - KOH$$

(c)
$$CH_3$$
— $CH = N$ — $OH \xrightarrow{P_2O_5}$ (d) CH_3 — C — $NH_2 \xrightarrow{P_4O_{10}}$

(d)
$$CH_3 - C - NH_2 - \frac{P_4O_{10}}{\Delta}$$

4. Which of the following compounds react with HNO₂?

(a)
$$\longrightarrow$$
 NO₂ (b) \longrightarrow NO₂ (c) \bigwedge NO₂ (d)

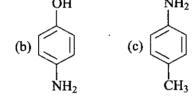
(b)
$$\rightarrow$$
 NO₂

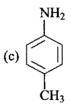
5. Consider the following reaction:

$$A \xrightarrow{\mathbf{K}_2 \mathrm{Cr}_2 \mathrm{O}_7, \, \mathrm{H}^{\oplus}} \mathrm{O} = \begin{array}{c} \\ \\ \end{array}$$

The starting substance 'A' can be:







6. C_6H_5 — CH_2 — $I \xrightarrow{\text{NaN}_3}$ Products

Reaction is assumed to involve nitrene as intermediate, then various possible products are:

(a)
$$C_6H_5CH_2NH_2$$
 (b) $C_6H_5N=CH_2$ (c) $C_6H_5CH=NH$ (d) C_6H_5CH

7. Which of the following can give 1° amine?

(a) Ph—CH— OH—NaCN, H^{$$\oplus$$}

(b) Ph—CH = CH—C—NH₂
$$\xrightarrow{\text{NaOCl}}$$
 $\xrightarrow{\text{CH}_3\text{OH}}$

(c) Ph—C
$$\equiv$$
 C—C—NH₂ $\xrightarrow{\text{NaOBr}}$

(d) Ph—C—Cl
$$\xrightarrow{\text{NaN}_3}$$
 LiAlH₄ $\xrightarrow{\text{LiAlH}_4}$

8. Which of the following can distinguish?

CH₃ H | CH₃—CH—NH₂ and CH₃—CH₂—N—CH₃ (a) (COOC₂H₅)₂ (b) NaNO₂ + HCl (c) CS₂, HgCl₂ (d) Ag₂O/
$$\Delta$$

Denomina is a days used in the treatment of Deskinson's disease.

9. Dopamine is a drug used in the treatment of Parkinson's disease:

Which of the following statements about this compound are correct?

- (a) It can exist only in optically active forms
- (b) One mole will react with 3 mole of NaOH to form a salt
- (c) It can exist as a zwitter ion in the aqueous solution
- (d) It gives nitroso compound on treatment with HNO₂
- 10. Which of the following give nitrosoamine on treatment with HNO₂?

(a)
$$N-H$$
 (b) $H_3C-CH-NH_2$ (c) CH_3 (d) $N-H$

11. Which of the following sequence of reagent is the good means to furnish the conversion?

$$R$$
— CH_2OH — $\to R$ — CH_2NH_2

- (a) KMnO₄, SOCl₂, NH₃, Δ, NaOBr
- (b) SOCl2, NaCN, H2/Ni
- (c) CrO₃ in dilute acetone, NH₃, H₂, Ni
- (d) Cu, 300°C, NH₂, LiAlH₄
- 12. Choose the correct comparisons of basicity:

(a)
$$\longrightarrow NH_2 < \bigvee_{N}$$
 (b) $\bigvee_{NH_2} > \bigvee_{N}$ (c) $\longrightarrow NH_2 > \bigvee_{N}$ (d) $2 \bigvee_{N} \bigvee_{N}$

- 13. Which of the following arrangements are correct with respect to the property of the compounds indicated in the parentheses? (a) HCOOH>CH₃COOH>CH₃CH₂COOH (Acidic strength)

 - (b) F COOH > Cl COOH > Br COOH (Acidic strength)
 - (c) Ph—C—OH > <math>Ph— $OH > \langle C \rangle$ >—OH (Acidic strength) -NH₂ (Base strength)
- 14. Which of the following products are formed when 1-propanamine is treated with $NaNO_2 + HCl?$

- 15. Which of the following will give Hofmann-Bromoamide reaction?
- 16. Which of the following reactions represent major products?
- 17. Which of the following products will not form by following reaction?
 - H₃C
 - CN(a) H_3C
- (b) H₃C
- N_2C1 (c) H_3C
- (d) H₃C

18. Ph—C—NH₂ + Ph—CH₂—C—N H₂
$$\stackrel{\Theta}{\longrightarrow}$$
 $A+B$

Products A and B are:

(a) Ph—NH₂

(b) Ph—CH₂ $\overset{15}{N}$ H₂

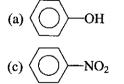
(c) Ph—CH₂—NH₂

- (d) Ph— 15 H₂
- 19. Reaction involves isocyanate as intermediate product:
 - (a) Curtius rearrangement
- (b) Lossen rearrangement
- (c) Schmidt rearrangement
- (d) Hofmann rearrangement
- 20. Consider the structures:

$$H_3C$$
 CH_3 H_3C CH_3 H H H_3C CH_3 NO_2 NO_2

Which of the following statements are correct?

- (a) Basic strength of II is greater than I
- (b) Basic strength of II is less than that of I
- (c) Basic strength of IV is greater than III
- (d) Basic strength of IV is less than that of III
- 21. Which of the following give Liebermann nitroso reaction?

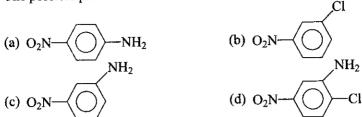


(b)
$$\bigvee$$
 N—CH₃

- 22. Which are related with Curtius rearrangement?
 - (a) NaN₃
 O
 ||
 (c) R—C—Cl

- (b) *R*—NH₂
 O
- 23. O_2N — $Cl \xrightarrow{NaNH_2}$ $liq. NH_3$

The possible products are:



- 24. Which of the following give Schiff base with aldehyde?
 - (a) CH₃CH₂NH₂

(b) C_6H_5 — CH_2 — NH_2 (d) C_6H_5 — NO_2

(c) $C_6H_5-NH_2$

- 25. Which of the following give aniline by reduction of nitrobenzene?
 - (a) $H_2/Pd-C$

(b) Sn + HCl (d) $(NH_4)_2S$

(c) Cu + HCl

26. Optically active amine having molecular formula C₅H₁₃N on reaction with NaNO₂ + HCl produces, 3° optically inactive alcohol. Find out structures of amines:

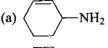
(a)
$$C_2H_5$$
 NH_2 (b) C_2H_5

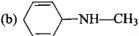
27. Find out products which are formed by the following reaction:

$$(a) H_2N \longrightarrow NH_2 \qquad (b) \longrightarrow NH_2 \qquad NH_2$$

$$(c) \longrightarrow NH_2 \qquad (d) \longrightarrow NH_2 \qquad (d) \longrightarrow NH_2$$

- 28. Which of the following is soluble in dil. aqueous HCl?
 - (a) $C_6H_5NH_2$ (b) $C_6H_5CH_2NH_2$ (c) $C_6H_5CONH_2$ (d) |
- 29. The structural form of a compound $A(C_6H_{11}N)$ is resolvable, dissolve in dil. HCl and reacts with HNO3. Compound A could be:





 $NHCH_3$ (d)

30. Which of the following basically exist as dipolar ion?

(a)
$$(b) H_3C \longrightarrow H$$
 (c) $H_2N \longrightarrow O$ (d) $H_2N \longrightarrow O$

EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

The conversion of an amide by action of NaOH and Br_2 to primary amine that has one carbon less than the starting amide is known as Hofmann-Bromoamide reaction.

$$R \longrightarrow C \longrightarrow NH_2 \xrightarrow{Br_2 + NaOH} R \longrightarrow NH_2 + NaBr + Na_2CO_3$$

Mechanism:

$$R - C - NH - N \xrightarrow{OH} R - C = NH + Br - Br \rightarrow R - C - N - Br$$

$$R - NH_2 + Na_2CO_3 \xleftarrow{H_2O} C = N - R \xleftarrow{Slow} R - C - N - Br$$

1. Number of moles of NaOH consumed in above reaction:

Find X and Y:

(a)
$$X = \begin{bmatrix} *NH_2 & NH_2 & *NH_2 \\ D & D & D \end{bmatrix}$$
; $Y = \begin{bmatrix} *NH_2 & *NH_2 \\ D & D & D \end{bmatrix}$

(c)
$$X = Y = \bigcirc$$

D

(d) \bigcirc
 $= X = Y$

3. \bigcirc

N—H $\xrightarrow{\text{NaOBr}}$ (X); Find out X:

(a) \bigcirc
 \bigcirc

NH₂
 \bigcirc

O

NH₂

O

NH

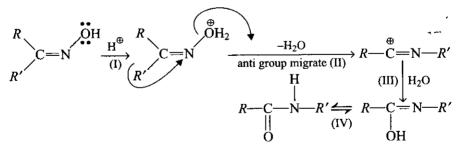
Ketoxime when heated with certain reagents undergoes rearrangement to form amides. This is known as Beckmann's rearrangement.

$$R \longrightarrow C \longrightarrow N \longrightarrow C \longrightarrow C \longrightarrow C \longrightarrow N \longrightarrow R'$$

$$R' \longrightarrow R \longrightarrow R \longrightarrow R \longrightarrow R'$$

$$N-Substituted amide$$

Mechanism:



4. Find out slowest step of the reaction:

4. Find out slowest step of the reaction:

(a) I

(b) II

(c) III

(d) IV

Ph

OH

$$C=N$$
 PCl_5
 H_3C

Find out (X):

Find out (X) of the reaction:

HO

Passage-3

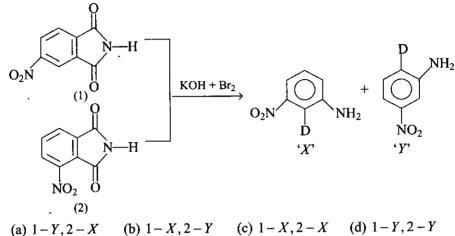
6.

$$\begin{array}{c|c}
 & & & & & & & & & & & & & & & \\
\hline
N & & & & & & & & & & & & & & \\
N & & & & & & & & & & & & \\
N & & & & & & & & & & & \\
\hline
N & & & & & & & & & & & \\
N & & & & & & & & & & \\
N & & & & & & & & & \\
N & & & & & & & & & \\
N & & & & & & & & & \\
N & & & & & & & & \\
N & & & & & & & & \\
N & & & & & & & & \\
N & & & & & & & \\
N & & & & & & & \\
N & & & & & & & \\
N & & & & & & & \\
N & & & & & \\
N & & & & & \\
N & & & \\
N & & & \\
N & & & \\
N & & \\
N & & & \\
N & & & \\
N & & \\
N$$

7. Which of the following amines cannot be prepared by path-I?

- NH_2 (a)
- (b) Ph NH_2 (c) $+NH_2$ (d)

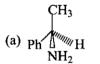
8. Consider path II, choose the major product for 1 and 2:



- (a) 1-Y, 2-X

9. In the path I, if

 $R = \frac{\text{CH}_3}{\text{Ph}}$ H, then the amine finally formed is:



(c) racemic mixture of a and b

(d) none of these

Passage-4

An organic compound 'A' has molecular formula C₉H₁₃NO and it can be resolved into enantiomers. A does not decolourise bromine water solution. A on refluxing with dilute H2SO4 yields another resolvable compound B (C9H14O3) which gives effervescence with NaHCO3. B on treatment with NaBH4 yields C (C9H16O3) on heating with concentrated H₂SO₄ yields ester D (C₉H₁₄O₂).

Compound A on reduction with LiAlH₄, followed by treatment of H₂SO₄ yields following compound:

10. Find out structure of compound 'A':

11. The sweet smelling neutral compound D is:

(a)
$$O$$
 O (b) O O O (c) O O (d) O

- **12.** Due to reduction of optically pure 'B' two isomeric product 'C' form. Isomeric product 'C' are:
 - (a) Enantiomers

(b) Diastereomers

(c) Position isomers

(d) Functional isomers

Passage-5

When an primary aromatic amine is treated with $NaNO_2 + HCl$ at $0^{\circ} - 5^{\circ}C$, a diazonium salt is formed and the reaction is called diazo reaction. In this reaction mineral acid must be added to prevent the coupling reaction of diazonium salt with excess of aryl amine. Diazonium salt is highly useful in the synthesis of number of coloured dyes.

13. For the following diazonium ion the decreasing order of reactivity of these ion in azo-coupling reaction:

(a)
$$Q > S > R > P$$

(b) Q > S > P > R

(c) P > Q > R > S

(d) S > R > Q > P

14. In the given reaction:

The final product is

$$(a) \bigvee_{COOH} N=N-\bigvee_{N$$

15. When 2, 4-dinitrophenol react with NaNO₂ + HCl at 5°C followed by reaction with anisole, a coloured compound is formed which can be given as:

(a)
$$N=N-O$$

NO₂

(b) $N=N$

NO₂

OCH₃

(c) O₂N

NO₂

OCH₃

(d) O₂N

NO₂

NO₂

EXERCISE-4: MATRIX MATCH TYPE



1. Column (I)

(a) Ph—CH₂—CH₂—N—CH₂CH₃
$$\xrightarrow{OH}$$
 \xrightarrow{OH} \xrightarrow{OH} $\xrightarrow{CH_3}$ CH₃

Column (1)

Colu

(b)
$$CH_3CH_2$$
 C $CH_3 \xrightarrow{NaCN} H^{\oplus}$ OH

(c)
$$CH_3CH_2$$
— $NO_2 \xrightarrow{Zn/NH_4Cl}$

$$\begin{array}{c} \text{CH}_{3} & \text{treatment with CHCl}_{3}, \\ \text{CH}_{3} & \text{CH}_{3} & \\ \text{CH}_{3} & \text{CH}_{3} & \\ \text{CH}_{3} & \text{CH}_{4} & \\ \text{CH}_{3} & \text{CH}_{2} & \\ \text{CH}_{4} & \text{CH}_{4} & \\ \text{CH}_{2} & \text{CH}_{4} & \\ \text{CH}_{2} & \text{CH}_{2} & \\ \text{CH}_{3} & \text{CH}_{2} & \\ \text{CH}_{3} & \text{CH}_{2} & \\ \text{CH}_{3} & \text{CH}_{3} & \\ \text{CH}_{4} & \\ \text$$

2. Column (I)

(b)
$$CH_3CH_2$$
— N — CH_3

$$(d)$$
 \sim NH_2

3. Column (I)

- (a) Hofmann degradation
- (b) Curtius rearrangement
- (c) Lossen rearrangement
- (d) Hemiaminal

Column (II)

- R. Gives positive Tollen's test
 - ammonolysis process
 - T. Hydroxyl amine

Column (II)

- P. Treatment of NaNO₂, HCl gives N-nitroso compound
- Q. Treatment of NaNO2, HCl gives diazoniumchloride
- R. Treatment of excess CH₂I followed by AgOH and heat gives out alkene
- S. Treatment of HCl, Δ gives dealkylation

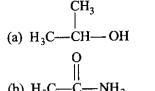
Column (II)

- P. Aldehyde + 1° amine
- Q. Isocyanate

$$R. Br_2 + KOH$$

$$\begin{array}{c}
O \\
\parallel \\
S. R-C-N=N=N
\end{array}$$

4. Column (I)



(c)
$$H_3C - N = C = O$$

(d) $R - N = C$

(d)
$$R - \stackrel{\oplus}{N} \equiv \stackrel{\ominus}{C}$$

5. Column (I)

O

(a)
$$R - C - NH_2 \longrightarrow R - CH_2NH_2$$

O

(b) $R - C - NH_2 \longrightarrow R - NH_2$

O

(c) $R - C - NH_2 \longrightarrow R - CN$

(b)
$$R \longrightarrow \stackrel{\text{i}}{\text{C}} \longrightarrow \text{NH}_2 \longrightarrow R \longrightarrow \text{NH}_2$$

(c)
$$R \longrightarrow C \longrightarrow NH_2 \longrightarrow R \longrightarrow CN$$

(d)
$$R \longrightarrow C \longrightarrow N_3 \longrightarrow RNH_2$$

6. Column (I)

(a) Ph
$$-$$
NH₂

(b)
$$\bigwedge_{NH_2}$$

7. Column (I) (Amines)

- (a) $C_2H_5NH_2$ and $C_6H_5NH_2$
- (b) $(C_2H_5)_3$ N and $(C_2H_5)_2$ NH
- (c) $C_2H_5NH_2$ and $(C_2H_5)_3N$
- (d) $(C_2H_5)_3N$ and $C_6H_5NH_2$

Column (II)

- P. Hydrolysis gives 1° amine
- Q. Reduction gives 2° amine
- R. Br₂, OH, gives bromoform
- S. NaOBr gives 1° amine
- T. Dehydration gives nitrile Column (II)
- P. Schmidt reaction
- $Q. P_2O_5$
- R. Hofmann reaction
- S. LiAlH₄

Column (II)

- P. Treatment of CS₂, HgCl₂ gives out alkyl isothiocyanate
- Q. Treatment of Ph—SO₂—Cl produces the compound insoluble in alkali
- R. Treatment of H_2O_2 , Δ gives out alkene
- S. Treatment of CS₂ produces dithio carbamic acid

Column (II) (Distinguished by)

- P. Carbylamine test
- Q. Azo dye test
- R. Hinsberg reagents
- S. Liebermann nitroso reaction

8. Column (I)

(a)
$$H_2N - NH_3C1$$

 NO_2

(d) O_2N

- (a) C_2H_5 —NH₂
- (b) $(C_2H_5)_2NH$
- $(c) (C_2H_5)_3N$
- $(d) C_6 H_5 N H_2$

Column (II)

- P. Na extract of compound gives prussian blue colour with FeSO4
- Q. Positive FeCl₃ test
- R. White ppt. with AgNO₃
- S. react with aldehyde to form the corresponding hydrazone derivative

Column (II)

- P. Reaction with NaNO₂ + HCl
- Q. Reaction with CHCl₃ + KOH
- R. Formation of N-nitrosodiethyl amine with HNO2
- S. Formation of triethyl ammonium nitroso with HNO2

EXERCISES INTEGER ANSWER TYPE PROBLEMS



1. Find out number of reactions which involve electron deficient nitrogen during reaction mechanism.

(a)
$$C = N$$
 Dilute. H_2SO_4 (b) $H_3C - C - Ph$ PhCO₃H

(c) $CH_3 - C - NH_2$ $Br_2 + KOH$ (d) $CH_3 - C - OH$ $C - CH_2N_2$ $A - CH_2N_3$ $A - CH_3$ $A - CH_3$

2. Examine the structural formulas of following compounds and identify how many compounds are more basic than aniline.



3. Of the following amines how many can give carbyl amine reaction.

4. Of the following reactions, how many reaction, are used for the preparation of amines.

amines.

(a)
$$R-C \equiv N \xrightarrow{\text{LiAiH}_4}$$

(b) $R-C-NH_2 \xrightarrow{\text{LiAiH}_4}$

(c) $R-C-NH_2 \xrightarrow{\text{Br}_2 + \mathring{O}H}$

(d) $R-C-CH_3 + H_3C-NO_2 \xrightarrow{\text{NaOH}}$

(e) $N^SK^{\oplus} \xrightarrow{R-X} H^{\oplus}/H_2O$

(f) $R-CH_3 \xrightarrow{N_2H_4, \mathring{O}H}$

(g) $R-C-NH_2 \xrightarrow{D}$

(h) $R-CH_2-NO_2 \xrightarrow{H_2, Ni}$

5. Of the following amines how many can be seperated by Hoffmann's mustard oil reaction.

$$Ph$$
 NH_2 , NH_2 , NH_2 , NH_2
 CH_3
 Ph
 NH_2 , NH_2
 CH_3



Exercise-1: Only One Correct Answer

Level-1									
1. (c) 11. (c)	2. (c) 12. (a)		4. (b)		6. (c) 16. (c) 1		8. (c)		10. (b)
21, (c) 31, (d)	22 . (b)	23. (a)	24. (b)	25. (d)	26. (c) 2	7_ (a,b,c)	18. (b) 28. (d) 38. (a,b)	29. (c)	20, (c) 30, (d)
41. (c)	34. (0)	30. (0)	34, (0)	3 3 (0)	3p. (U/ 3	y. (U.U)	30 . (a,u)	39. (U)	w(IL (8)
Level-2	mary - reading								
1 (c) 11. (c)	2. (d) 12. (a)	3. (d) 13. (b)	4. (b)	_	6. (c) 15. (d)			9. (b) 19. (b)	10. (c) 20. (a)
21. (a) 31. (a)	22, (c) 32, (a)	23. (c) 33. (d)		25. (d) 35. (b)	2 i (b) 36. (d)	27 (c) 37. (a)		29 . (a)	30. (c) 40. (d)
41, (a) 51. (d)	42. (b) 52. (a)	43. (c) 53. (b)	44. (d) 54. (c)	55 . (a)	56. (d)	\$7 (b)		69. (b)	50. (c) 60. (a)
61. (b) 71. (c)	62, (d) 72, (a) 82 (d)	68, (b) 73 (d) 83, (b)	54. (c) 74. (d)		76. (c)	77. (b)	68. (a) (78. (d) (70. (a) 80. (b)

Exercise-2: More Than One Correct Answers

1	(a, b, c)	2.	(a, b, c)	3.	(a, c, d)	4.	(b, c, d)	6.	(a, b, d)	6.	(b, c)
17.	(b, c, d)	8,	(a, b, c)	9.	(a, b, c)	10.	(a, c)	17.	(a, b, c)	12	(a b c)
13.	(a, b, c) (a, b, c, d)	14.	(a, c, d)	15.	(a, b, c)	16.	(a, b, c)	17.	(a, c, d)	18.	(a, b)
13	(a, b, c, d)	<i>2</i> 0.	(a, c)	21	(a. b)	42.	(a, b, c)	23.	(a, c)	2¢.	(a, b, c)
25,	(a, b, c, d)	20	(a, c)	27,	(a, b)						

Exercise-3: Linked Comprehension Type

1. (d)	2. (b)	3. (a)	4, (b)	\$. (c)	5. (d)	7. (c)	8. (a)	9. (b)	10. (b)
11. (c)	12. (b)	13, (b)	14. (a)	15. (c)			•		1

Exercise-4: Matrix Match Type

1. (a) \rightarrow 0;	(b) $\rightarrow P, R, S$;	$(c) \rightarrow R, T$;	$(d) \rightarrow T$
2. (a) $\rightarrow R$, S;	(b) $\rightarrow P, R, S$;	$(c) \rightarrow S$;	(d) → Q
3. (a) $\rightarrow Q, R$:	(b) $\rightarrow Q$, S:	(c) $\rightarrow 0$;	(d) → P
4. (a) → R;	(b) \rightarrow S, T;	(c) $\rightarrow P, Q, S$;	$(d) \rightarrow P, O, S$
5. (a) \rightarrow S;	(b) $\rightarrow R$;	(c) $\rightarrow Q$;	$(d) \rightarrow P$
6. (a) → P, S;	(b) $\rightarrow P.S$:	(c) $\rightarrow R$;	$(d) \rightarrow Q, S$
7. (a) \rightarrow Q ;	(b) $\rightarrow R, S$;	(c) $\rightarrow P,R$;	$(d) \rightarrow P, Q, R$
R (a) $\rightarrow R$, S	(b) $\rightarrow P, Q$	$(c) \rightarrow P, Q$	$(d) \rightarrow P, S$
P (a) $\rightarrow P$, Q	$(b) \rightarrow P, R$	(c) → P, S	$(d) \rightarrow P, Q$

Exercise-5: Integer Answer Type Problems

1. (4) 7 2.	(5)	Ŧ. (3)	4, (5)	



Aromatic Hydrocarbons

(EXERGISE) ONLY ONE CORRECT ANSWER





A and B are:

- (a) identical
- (c) geometrical isomers
- (b) position isomers
- (d) none of these
- 2. Benzene reacts with Cl₂ in the presence of FeCl₃ and in absence of sunlight to form:
 - (a) benzyl chloride

- (b) benzal chloride
- (c) chlorobenzene (d) benzenehexa chloride

→ Product. Find correct product.

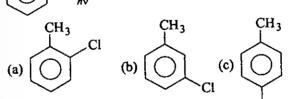
- 3. Phenol gives Reimer Tiemann reaction with:
 - (a) CHCl₃

(b) CCl₄

(c) CHCl₃ and CCl₄

(d) C₆H₅CHCl

CH₃



CH₂—Cl

- 5. Benzyl chloride can be prepared by reacting:
 - (a) Toluene with Cl₂ in the presence of FeCl₃
 - (b) Benzene with CH₃Cl in the presence of AlCl₃
 - (c) Toluene with Cl₂ in the presence of sunlight
 - (d) Benzene with Cl₂ in the presence of FeCl₃

Cl + CH₃ONa
$$\longrightarrow P$$
 (major); P is:

(d) None of these

7. (I)
$$\longrightarrow$$
 Br $\xrightarrow{NH_2^-}$ Product

(II)
$$\bigcup_{D} \xrightarrow{NH_{2}^{-}} Product$$

- (a) II is more reactive than I.
- (c) Both have same reactivity.
- (b) I is more reactive than II
- (d) None of these

- (a) (I) is more stable than (II)
- (c) (l) and (II) have same stability
- (b) (II) is more stable than (I)
- (d) None of these

9.
$$CH_2CI$$

Conc. $HNO_3 \rightarrow B$; B is:

(d) All of these

Br

(c)

Na⁺

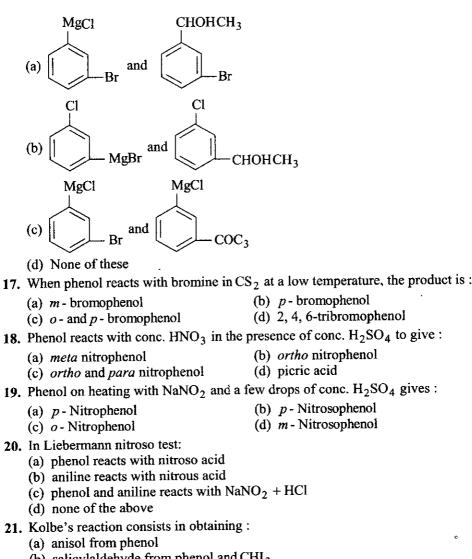
SO₂O

(d) None of these

13.
$$CH_3$$
 CH_3
 CH_2
 CH_3
 CH_3
 CH_3
 CH_2
 CH_3
 CH_3

16. What are A and B in the following reaction?

$$Br \xrightarrow{Mg/THF} A \xrightarrow{\text{(i) CH}_3\text{CHO}} B$$



- 21. Kolbe's reaction consists in obtaining:
 - (b) salicylaldehyde from phenol and CHI₃
 - (c) salicylic acid from sodium phenate and CO₂
 - (d) salicylic acid from phenol and CO₂
- 22. Which derivative of phenol gives effervescence with NaHCO₃?
 - (a) o-Cresol

(b) Catechol

(c) 2, 4, 6-Trinitrophenol

- (d) 2, 4, 6-Tribromophenol
- 23. Phenol and benzoic acid can be distinguished by:
 - (a) aqueous NaHCO₃

(b) aqueous NaNO₂

(c) aqueous NaOH

- (d) conc. H₂SO₄
- 24. Phenol and cyclohexanol can be distinguished by using:
 - (a) FeCl₃
- (b) Na
- (c) PCl₃
- (d) CH₃COCl

- 25. The compound which will readily couple with benzene diazonium chloride is:
 - (a) benzoic acid
- (b) phenol
- (c) benzene
- (d) benzaldehyde
- 26. Phenol can be converted into salicylic acid by heating with:
 - (a) CO₂ (under pressure) and alkali
 - (b) CCl₄ and alkali
 - (c) CHCl₃ and alkali, followed by oxidation
 - (d) all of the above
- 27. In chlorobenzene, the Cl group:
 - (a) activates the benzene ring more, via resonance effect than deactivating it via inductive effect
 - (b) deactivates the benzene ring more, via inductive effect than activating it via resonance effect
 - (c) activates the benzene ring via resonance effect and deactivates it via inductive effect. Both these effect are evenly matched.
 - (d) it is a net deactivating group with director characteristics
- 28. Identify 'Z' in the reaction given below:

$$\begin{array}{c|c}
 & NH_2 \\
\hline
 & 1. \text{ HNO}_2(280\text{K}) \\
\hline
 & 2. \text{ H}_2\text{O}; \text{ Boil}
\end{array}$$

$$\begin{array}{c|c}
 & NH_2 \\
 & CH_3
\end{array}$$

$$\begin{array}{c|c}
 & N_2\text{Cl} \\
 & CH_3
\end{array}$$

$$\begin{array}{c|c}
 & OCH_3
\end{array}$$

- 29. Rate of substitution reaction in phenol is:
 - (a) slower than the rate of benzene
- (b) faster than the rate of benzene
 - (c) equal to the rate of benzene
- (d) none of these
- 30. Identify (A), (B) and (C) in the following reaction sequence.

$$C_6H_5OH \xrightarrow{(A)} C_6H_6 \xrightarrow{(B)} C_6H_5NO_2 \xrightarrow{(C)} Azobenzene$$

(a) $(A) = NaOH + CaO, (B) = conc. H_2SO_4 + conc. HNO_3, 60 - 70°C, (C)$

= glucose + NaOH

(b) $(A)=\text{Zn power}, (B)=\text{conc. H}_2\text{SO}_4+\text{conc. HNO}_3, 100^{\circ}\text{C}, (C)=\text{NH}_4\text{Cl}+\text{Zn}$

- (c) (A) = Zn, $(B) = \text{conc. H}_2\text{SO}_4 + \text{conc. H}_3\text{NO}_3$, $60 70^{\circ}\text{C}$ (C) = Zn + NaOH
- (d) (A) = NaOH + CaO, $(B) = \text{conc. HNO}_3 + \text{conc. H}_2\text{SO}_4$, Reflux 24 hrs. (C)

 $=CH_3OH + Na$

31. The best method for the preparation of chlorobenzene is:

(a)
$$\langle \bigcirc \rangle$$
 + $\operatorname{Cl}_2 \xrightarrow{\operatorname{FeCl}_3} \langle \bigcirc \rangle$ - Cl
(b) $\langle \bigcirc \rangle$ - OH + $\operatorname{PCl}_5 \xrightarrow{hv} \langle \bigcirc \rangle$ - Cl + HCl_3 + HCl
(c) $\langle \bigcirc \rangle$ + $\operatorname{Cl}_2 \xrightarrow{hv} \langle \bigcirc \rangle$ - Cl .

- 32. Which of the following reaction is called 'Schotten-Baumann' reaction?
 - (a) $C_6H_6 \xrightarrow{AlCl_3/CH_3COCl} C_6H_5COCH_3$
 - (b) $C_6H_5NH_2 \xrightarrow{CH_3COCI} C_6H_5NHCOCH_3$
 - (c) $C_6H_5OH \xrightarrow{C_6H_5COCl} C_6H_5OCOC_6H_5$
 - (d) $C_6H_6 \xrightarrow{AlCl_3} C_6H_5COC_6H_5$
- 33. Which of the following is nor correctly matched?
 - (a) Phenol + CHCl₃ + NaOH $\xrightarrow{\text{Heat}}$ Salicylaldehyde
 - (b) Phenol + Phthalic anhydride $\xrightarrow{\text{Heat}}$ Phenetole
 - (c) Phenol $\xrightarrow{\text{Br}_2 \text{ water}}$ Tribromophenol

OH

- (d) Sodium phenate $+CO_2 \xrightarrow{\text{Heat, Pressure}} Salicylic acid$
- 34. Identify the end product (b) of the following sequence of reaction.

$$\begin{array}{c|c}
\hline
 & Conc. \ H_2SO_4 \\
\hline
 & 100^{\circ}C
\end{array}
\xrightarrow{A} \xrightarrow{Br/H_2O} B$$

$$\begin{array}{c}
OH \\
Br
\\
SO_3H
\end{array}$$

$$\begin{array}{c}
OH \\
Br
\\
Br
\\
Br
\end{array}$$

35. Benzene can be obtained by:

(a)
$$C_6H_5OH + NaOH \xrightarrow{CuO} \Lambda$$

(b)
$$C_6H_5OH + Zn \xrightarrow{\Delta}$$

(c)
$$C_6H_5 - N = N - Cl + H_2O \longrightarrow$$
 (d) All of these

- 36. Point out incorrect statement about resonance.
 - (a) Resonance structure should have equal energy.
 - (b) In resonance structures, the constituent atom should be in the same position.
 - (c) In resonance structure there should be the same number of electron pairs.
 - (d) Resonance structures should differ only in the location of electrons around the constituent atoms.

37.
$$CH_2 CH_2 CH_2 CI \xrightarrow{AlCl_3} hydrocarbon (X)$$

$$CH_3$$

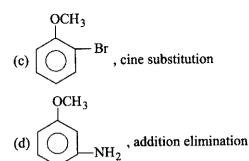
The major product X is:

(a)
$$CH_2CH-CH_3$$
 (b) CH_3 (c) CH_3 (c) CH_3 (d) none is correct

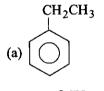
38.
$$OCH_3$$
 Br
 OCH_3
 OCH_3
 OCH_3
 OCH_3

(a)
$$NH_2$$
, elimination addition OCH_3

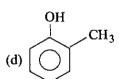
(b)
$$NH_2$$
 , elimination addition



- 39. In the sulphonation, acetylation and formylation of benzene the group of effective electrophiles would be?
 - (a) $SO_3^+, CH_3C \stackrel{+}{=} \stackrel{+}{O}, HCO$
- (b) SO_3 , CH_3 — $C \equiv 0$, HCO
- (c) SO₃, CH₃CHO, CO + HCl
- (d) HSO₃, CH₃CO, HCO
- 40. Benzoic acid may be prepared by the oxidation of:







- 41. Chloral + $\langle Cl \rangle$ Conc. $H_2SO_4 \rightarrow Product$. The product is :
 - (a) lindane

(b) DDT

(c) tefflon

- (d) ethaneperchlorate
- 42. Which of the following is not an aromatic compound?









43. The correct order of stability of ions is:









(a) I < IV < II < III

(b) III < II < IV < I

(c) IV < I < II < III

- (d) none of these
- 44. Number of π electrons present in naphthalene is:
 - (a) 2
- (b) 4
- (c) 10
- (d) 14

- 45. Dipole moment of which compound will be zero?

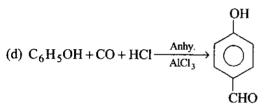
(c) Br — Br

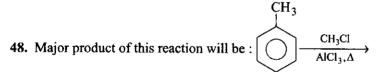
- (d) All of these
- **46.** $X \xrightarrow{\text{Cl}_2}$ Benzotrichloride $\xrightarrow{\text{Hydrolysis}} Y$. What are X and Y respectively?
 - (a) Benzene, Benzaldehyde
- (b) Toluene, Benzaldehyde
- (c) Toluene, Benzoic acid
- (d) Benzene, Benzoic acid
- 47. Which of the following reactions is not an example of electrophilic substitution?

(a)
$$C_6H_6 + {}^+NO_2 \longrightarrow C_6H_5NO_2 + H^+$$

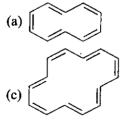
(b)
$$C_6H_5 + CH_3C1 \xrightarrow{AIC1_3} C_6H_5 - CH_3 + HC1$$

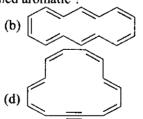
(c)
$$C_6H_6 + Cl_2 \xrightarrow{\text{UV light}} C_6H_6Cl_6$$





- (a) o-xylene
- (b) p-xylene
- (c) both
- (d) m xylene
- 49. Which of the following may best be called aromatic?



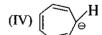


50. Amongst the ions, the aromatic character is shown by:



(II) H





- (a) I and III
- (c) II and III

(b) II and IV (d) I, II, III and IV



		VEL-Z
1.	The carbon atoms of benzene are:	
	(-) 2 3 - 4 - 1 - 1	<i>a</i> >

(a) sp²-hybridised

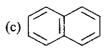
(b) sp-hybridised

(c) sp³-hybridised

- (d) Non-hybridised
- 2. The C—C bond order in benzene is:
 - (a) 1
- (b) 2
- (c) 1.5
- (d) 1.3
- 3. Which of the following compounds is non aromatic?









4. Which of the following compounds will show aromatic character?









- (a) II and IV
- II (b) I, II and IV
- (c) II and III
- (d) I and II

- 5. A molecule of benzene has:
 - (a) 6σ and 9π bonds

(b) 9σ and 3π bonds

(c) 12σ and 3π bonds

- (d) 6σ and 3π bonds
- 6. Which of the following species is not aromatic?



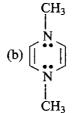


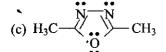




7. Which one of the following compounds is not aromatic?

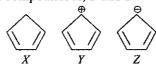






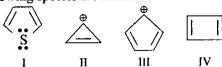


8. The order of stability of compounds X, Y and Z:



- (a) X > Y > Z
- (b) Y > Z > X
- (c) Z > X > Y
- (d) X > Z > Y

9. Which of the following species are antiaromatic?



- (a) III and IV
- (b) I and III
- (c) I and II
- (d) I and IV
- 10. When sodium benzoate is heated with soda lime, the product formed is:
 - (a) phenol

(b) chlorobenzene

(c) benzene

- (d) benzaldehyde
- 11. Among the following compounds that can be most readily nitrated is:
 - (a) benzene

(b) benzaldehyde

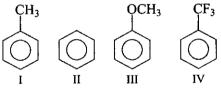
(c) toluene

- (d) chlorobenzene
- 12. Which of the following compounds is most readily nitrated is?
 - (a) benzene

(b) phenol

(c) toluene

- (d) nitrobenzene
- 13. Among the compounds the order of decreasing reactivity towards electrophilic substitution is:



(a) II > I > III > IV

(b) III > I > II > IV

(c) III > I > IV > II

- (d) II > I > IV > III
- 14. The following reaction is an example of:

$$+ CH_3Cl \xrightarrow{Anhydride AlCl_3} + HC$$

(a) Wurtz reaction

- (b) Kolbe electrolysis
- (c) Friedel-Crafts reaction
- (d) Grignard synthesis
- 15. The function of anhydrous AlCl₃ in Friedel-Crafts reaction is to:
 - (a) absorb water

- (b) produce a nucleophile
- (c) produce an electrophile
- (d) absorb HCl
- 16. The presence of which one of the following groups on benzene nucleus activate it towards electrophilic substitution:



17. Which one of the following compounds give only one isomer upon nitration?

$$(a) \begin{picture}(20,10) \put(0,0){\line(1,0){13}} \pu$$

18. In the given reaction

- 19. Which one of the following aromatic compounds fails to undergo Friedel-Crafts reactions?
 - (a) C_6H_5 — CH_3 (b) C_6D_6
- (c) C_6H_5 — NO_2 (d) C_6H_5Cl
- 20. The reaction least likely to occur is:

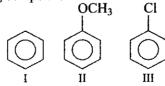
(a)
$$C_6H_6 + HNO_3 \xrightarrow{H_2SO_4} C_6H_5NO_2$$

(b)
$$C_6H_6 + H_2SO_4 \longrightarrow C_6H_5SO_3H$$

(c)
$$C_6H_6 + Br_2 \xrightarrow{Fe} C_6H_5Br$$

(d)
$$C_6H_6 + Cl_2 \xrightarrow{UV} C_6H_5Cl$$

21. Consider the following compound



The relative reactivity towards halonium ion is such that:

- (a) I > II > III
- (b) II > I > III
- (c) II > III > I
- (d) III > I > II

22. In the given reaction,
$$C_6H_5$$
— $NH_2 \xrightarrow{Ac_2O} X \xrightarrow{Cl_2} Y \xrightarrow{H_2O} Z$.

The product Z will be:

(a) o-chloroaniline

(b) mixture of o- and p-chloroaniline

(c) 2, 4-dichloroaniline

(d) 2, 4, 6-trichloroaniline

23.
$$Ph_2CH \longrightarrow CH_3 \xrightarrow{Excess Cl_2/hv} gives :$$

(a)
$$CCl_3$$

(b)
$$Cl$$
— CH_2Cl

(d) None of these

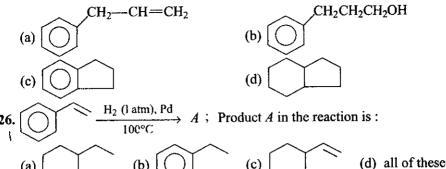
24.
$$\underbrace{\frac{(CH_3)_2C=CH_2}{H_2SO_4}}_{\text{gives}} \text{ gives}$$

OCH₃

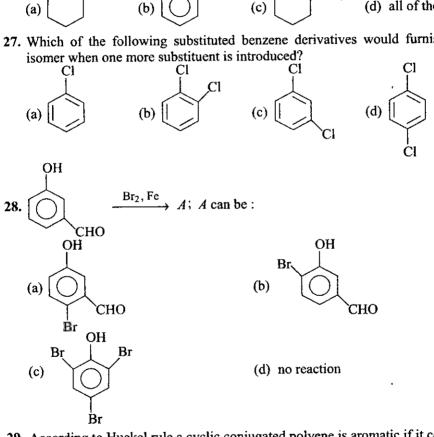
$$(d) \bigcirc \begin{matrix} CH_3 \\ CH_3 \\ CH_3 \end{matrix}$$

compound C will be:





27. Which of the following substituted benzene derivatives would furnish three



- 29. According to Huckel rule a cyclic conjugated polyene is aromatic if it contains:
 - (a) $(4n+1)\pi$ -electron (c) $(2n+2)\pi$ -electron

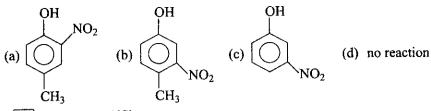
- (b) $(4n+2)\pi$ -electron (d) $4n\pi$ -electron
- $A \xrightarrow{\text{Conc. HNO}_3} B \xrightarrow{\text{NaOH}}$ 30. Phenol-

In the above reaction A, B and C are:

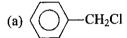
- (a) benzene, nitrobenzene and aniline
- (b) benzene, dinitrobenzene and m-nitroaniline



(c) benzene, nitrobenzene and hydrazobenzene (d) toluene, m-nitrobenzene and m-toludine 31. When phenol is treated with excess of bromine water, it gives: (a) m-bromophenol (b) o-and p-bromophenol (c) 2, 4-dibromophenol (d) 2, 4, 6-tribromophenol 32. Picric acid is yellow coloured compound, its chemical name: (a) m-nitrobenzoic acid (b) 2, 4, 6-trinitrophenol (c) trinitrotoluene (d) trinitroaniline 33. The product of following reaction is $C_6H_6 + Cl_2 \xrightarrow{hv}$? (b) ortho C₆H₄Cl₂(c) C₆H₆Cl₆ (a) C₆H₅Cl (d) para C₆H₄Cl₂ 34. Which of the following compounds react slower than benzene in electrophilic bromination? (c) $C_6H_5NO_2$ (d) $C_6H_5NH_2$ (b) C₆H₅OH (a) $C_6H_5CH_3$ 35. The reaction + N₂ + CuCl, is known as: (a) Wurtz reaction (b) Sandmeyer reaction (d) Friedel-Crafts reaction (c) Gattermann reaction $\xrightarrow{\text{HNO}_3} X; X \text{ is}:$ CH₃-36. H₃C (a) H_3C CH₃ NO_2 (c) HOO COOH (d) none of these OH OH37. Y can be: (a) Br₂ water (b) Br_2/CS_2 (c) both (a) and (b) (d) none is correct OH 38. \rightarrow A: A can be:



39.
$$\langle \bigcirc \rangle$$
 + $CH_2Cl_2 \xrightarrow{AlCl_3} A$; A is:



(b)
$$\langle \bigcirc \rangle$$
—CHCl₂

(c)
$$\langle \bigcirc \rangle$$
 — CH_2 — $\langle \bigcirc \rangle$

(d)
$$\langle \bigcirc \rangle$$

40.
$$CH_3$$
— CH_2 — CI $\xrightarrow{AlCl_3}$ compound X ; is:

(a)
$$\sim$$
 CH₂-CH₂CH₂CH₃ (b)

(c)
$$CH_2$$
— CH — CH_3 (d) all are correct CH_3

41. Consider the following reaction:

$$\begin{array}{c}
\text{CF}_3 \\
& \xrightarrow{E^{\oplus}}
\end{array}$$
 Product

- (i) CF₃ will activate benzene ring
- (ii) CF3 will deactivate benzene ring
- (iii) CF₃ is m-directing
- (iv) CF₃ is o/p directing
- Select the correct options: (a) (i) and (iv)
- (b) (ii) and (iii)

(c) (i) and (iii)

(d) (ii) and (iv)

42. In the given reaction, what is the product?

$$+ CH_2 = CH - CH_2 - CI \xrightarrow{ZnCl_2}$$
Product + HCl

$$CH_3$$
 CH_2 — $CH=CH_2$

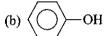
(a) CH_2 — $CH=CH_2$

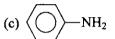


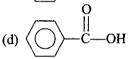
- 43. The reaction of toluene with Cl₂ in presence of FeCl₃ gives:
 - (a) benzoyl chloride

- (b) benzyl chloride
- (c) o-and p-chlorotoluene
- (d) m-chlorotoluene
- 44. Chlorination of toluene in the presence of light and heat followed by treatment with aq. KOH and subsequently with dil. HCl gives:





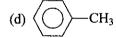




45. Among the following compounds that can be most readily sulphonated is:

(b)
$$\langle \bigcirc \rangle$$
 NO₂ (c) $\langle \bigcirc \rangle$ CI





- 46. Aniline react with NaNO₂ and dil. HCl at 0-5°C to form:
 - (a) p-nitro aniline

- (b) 2, 4, 6-trinitroaniline
- (c) benzene diazonium chloride
- (d) benzene
- 47. In the chlorination of benzene with Cl₂ in the presence of FeCl₃ the electrophilic species that attack the benzene ring is:
 - (a) Cl[⊕]

(b) Cl—Cl—FeCl₃

(c) Cl^Θ

- (d) Cl^{*}
- 48. Which of the following represents Friedel-Crafts reaction?

(a)
$$C_6H_6 + C_2H_5C1 \xrightarrow{AlCl_3} C_6H_5C_2H_5 + HC1$$

(b)
$$C_6H_5OH + HCl \xrightarrow{ZnCl_2} C_6H_5Cl + H_2O$$

(c)
$$C_6H_5CI + CH_3COCI \xrightarrow{AICI_3} C_6H_5COCH_3 + Cl_2$$

(d)
$$C_2H_5Br + Mg \xrightarrow{\text{ether}} C_2H_5MgBr$$

49. The major product formed in the reaction

$$C_6H_5$$
— $N \equiv N Cl^{\Theta} + H_3PO_2 + H_2O \longrightarrow is:$

(a) C₆H₅OH

(b) C_6H_5Cl

(c) C_6H_6

(d) C6H5C6H5

50. The major product formed in the reaction:

Conc.
$$HNO_3+H_2SO_4$$
 is:

(a)

NO₂

(b)

NO₂

(c)

NO₂

(d)

NO₂

1. In the reaction the major product formed is:

$$(a) \xrightarrow{Br_2(1 \text{ Mole})} Fe$$

$$(b) \xrightarrow{Br} O$$

$$(c) \xrightarrow{N} O$$

$$(d) \xrightarrow{N} -Br$$

2. This reaction is an example of:

$$\begin{array}{c|c}
O & O \\
\parallel & O \\
NH - C - CH_3 & Br_2/Fe
\end{array}$$
Br - $\begin{array}{c|c}
O & O \\
\parallel & O \\
NH - C - CH_3$

- (a) substitution reaction
- (b) addition reaction
- (c) condensation reaction
- (d) elimination reaction

3. The major product formed in the reaction is:

Friedel-Crafts acylation reaction can be used to obtained the compounds:

(a) II, III and IV (b) I,

(b) I, II and IV

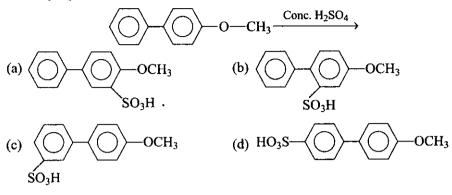
(c) I and II

(d) II and III

6. The major product in the reaction is:

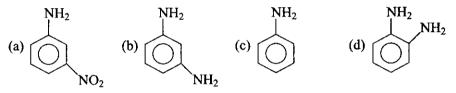


7. The major product formed in the reaction:

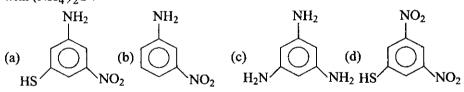


8.
$$Conc. HNO_3 \rightarrow P \xrightarrow{Sn, Conc. HCl} Q$$

The product Q is:



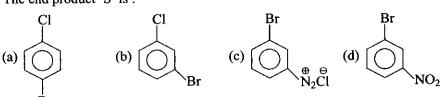
9. Which of the following is formed as a product when *m*-dinitrobenzene is treated with (NH₄)₂S?

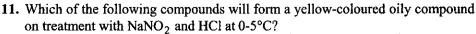


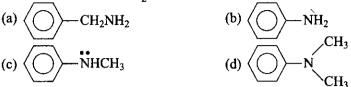
10. Consider the following reactions,

$$\begin{array}{c}
NO_{2} \\
& \downarrow \\
&$$

The end product 'S' is:



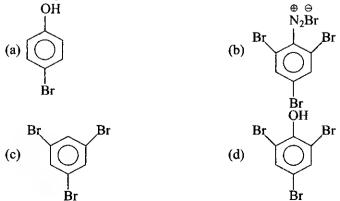




- 12. In Friedel-Crafts acylation reaction the electrophile is:
 - (a) R^{\oplus} (b) $R \stackrel{\circ}{C} = O$ (c) $R \stackrel{\circ}{C} = O$ (d) $R \stackrel{\circ}{C} = O \stackrel{\circ}{AlCl_2}$
- 13. N, N-Dimethyl aniline react with NaNO2 and dilute HCl at 0-5°C to form :

(a)
$$Me$$
 N_2Cl N_2Cl (b) N_1Cl N_1Cl

The end product Y is:



15. Identify the end product (Y) of the following sequence of reaction:

$$OH \longrightarrow Conc. H_2SO_4 \longrightarrow Y$$

$$OH \longrightarrow Br \longrightarrow Br$$

$$SO_3H \longrightarrow Br$$

$$OH \longrightarrow Br$$

$$SO_3H \longrightarrow OH$$

$$Conc. H_2SO_4 \longrightarrow Y$$

$$OH \longrightarrow Br$$

$$SO_3H \longrightarrow OH$$

$$OH \longrightarrow Br$$

16. The action of $\mathrm{Br_2/H_2O}$ on salicylic acid results in the formation of :

Br COOH

(a)

OH

OH

Br OH

Br COOH

(b)

Br COOH

OH

Br Br COOH

(d)

NH—C—CH₃

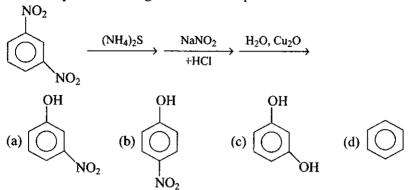
NH—C—CH₃

$$\xrightarrow{Br_2}$$
 A $\xrightarrow{H/H_2O}$ B $\xrightarrow{NaNO_2 + HCl}$ C $\xrightarrow{H_2O}$ D

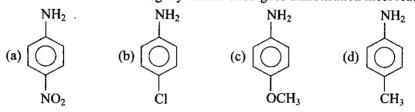
CH₃

In the above sequence of reactions which one is not correct?

18. The final product of the given reaction sequence:



19. Which one of the following aryl amine undergoes diazotisation most readily?



20. In the given reaction sequence

$$C_6H_5NO_2 \xrightarrow{Sn/HCl} A \xrightarrow{NaNO_2 + HCl} B \xrightarrow{CuCN/HCN} C \xrightarrow{H_2O/H^{\bigoplus}} D$$

which one is not correct?

- (a) $A ext{ is } C_6H_5NH_2$
- (b) $B \text{ is } C_6H_5 N \equiv N \text{ Cl}$
- (c) C is $C_6H_5CH_2CN$
- (d) D is C₆H₅COOH
- 21. Which one of the following substrate will not form benzyne when treated with NaNH₂?

(a)
$$C_6H_5Cl$$
 (b) CH_3 (c) CH_3 (d) CH_3

22.
$$Cl \xrightarrow{C_2H_5ONa} P; P \text{ is :}$$

$$NO_2 \xrightarrow{OC_2H_5} Cl \xrightarrow{NO_2} OC_2H_5$$

$$Cl \xrightarrow{OC_2H_5} Cl \xrightarrow{NO_2} OC_2H_5$$

$$Cl \xrightarrow{OC_2H_5} OC_2H_5$$

$$Cl \xrightarrow{OC_2H_5} Cl \xrightarrow{OC_2H_5} Cl$$

$$Cl \xrightarrow{OC_2H_5} Cl \xrightarrow{OC_2H_5} Cl$$

23. Which one of the following is most stable carbocation?

OH CI CH₃ NHCOCH₃
(a)
$$\bigoplus_{\oplus}$$
 (b) \bigoplus_{\oplus} (c) \bigoplus_{\oplus} (d) \bigoplus_{\oplus} NHCOCH₃

24. Which one of the following is most stable carbanion?

(a)
$$O_2$$
 O_2 O_2 O_2 O_2 O_3 O_4 O_4 O_4 O_4 O_5 O_5 O_5 O_6 O_7 O_8 O_8

25. Nitration of the following compound will occur at which position?

$$H_3C$$
 $\xrightarrow{1}$ $\xrightarrow{4}$ NO_2 (b) at C $\xrightarrow{-2}$

(a) at C--1

(c) at C-3

- (d) at C---4
- 26. Nitrating agent for aromatic compound may be:
 - (a) N_2O_5

(b) C₂H₅ONO₂

(c) NO₂CF₃SO₃

(d) all of these

27.
$$\langle \bigcirc \rangle$$
 + CH₃—CH₂CH₂CH₂—Cl $\xrightarrow{\text{AlCl}_3} X$; Major product X is :

(b)
$$CH_3$$
 CH_3 CH_3

(c)
$$\langle \bigcirc \rangle$$
—CH₂CH₂CH₂CH₃

(d) none is correct

28.
$$A \leftarrow Br_2 \longrightarrow KMnO_4 \rightarrow B$$

Compound A and B respectively are:

- (a) o-bromo styrene, benzoic acid
- (b) p-bromo styrene, benzaldehyde
- (c) m-bromo styrene, benzaldehyde
- (d) styrene dibromide, benzoic acid

29. Consider the reaction

$$(a) \xrightarrow{\text{OH}} + \text{ClN}_2 \xrightarrow{\text{OH}} A \text{; Here } A \text{ is :}$$

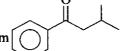
$$(a) \xrightarrow{\text{NH}_2} \text{OH}$$

$$(b) \xrightarrow{\text{NH}_2} \text{N} = \text{N}$$

$$(c) \xrightarrow{\text{OH}} \text{OH}$$

$$(d) \text{ none of these}$$

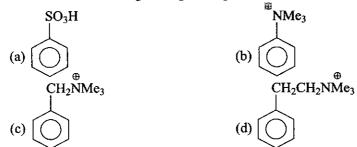
- 30. In which of the following reactions tertiary butyl benzene is formed?
 - (a) $\langle \bigcirc \rangle$ + Me₃C—OH + BF₃
- (b) $\langle \bigcirc \rangle$ + Me₂C=CH₂ + H₂SO₄
- (c) $\langle \bigcirc \rangle$ + Me₂CH—CH₂Cl + AlCl₃ (d) All of these
- 31. Benzene on reaction with A form



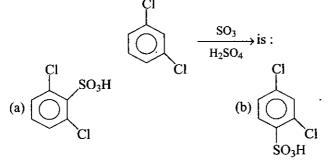
which on reaction with B

form
$$A$$
 and B are:

- (a) Cl; LiAlH₄
- (b) Zn (Hg)+Conc. HCl;
- (c) Cl; NaBH₄
- (d) Cl; Zn (Hg) + Conc. HCl
- 32. Which of the following undergoes sulphonation fast?



33. The major product obtained in the reaction



$$(c) \qquad \qquad (d) \qquad (c) \qquad \qquad (c) \qquad \qquad (d) \qquad (c) \qquad \qquad (d) \qquad (d$$

34. The major product obtained in the reaction

$$\begin{array}{c|c}
\hline
& C \\
& C \\
\hline
& C \\
&$$

is expected to be:

(a)
$$O_2N$$
—C— CH_2 —(b) (b) C— CH_2 —NO₂
(c) CH—CH—O (d) C— CH_2 —NO₂
 NO_2

35. The major product in the reaction COOH

$$(a) \xrightarrow{Br_2 + FeBr_3} is:$$

$$(a) \xrightarrow{COOH} COOH$$

$$(b) \xrightarrow{COOH} COOH$$

$$(c) \xrightarrow{Br} COOH$$

$$(d) \xrightarrow{Br} COOH$$

36. The order of reactivity of the following compounds

$$C_6H_5CH_3$$
 $C_6H_5CH_2CH_3$ C_6H_5CH CH_3 C_6H_5 CH_3 C_6H_5 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3

towards electrophilic substitution will be:

(a) I > II > III > IV

(b) IV > III > II > I

(c) II > I > III > IV

(d) III > II > IV

- 37. In sulphonation, acylation and formylation of benzene the group of effective electrophiles would be:
 - (a) SO_3^{\oplus} , CH_3 — $C \equiv 0$, HCO
- (b) SO₃H, CH₃CO, HCO
- (c) SO_3 , CH_3 — $C \equiv O$, HCO
- (d) SO₃, CH₃CHO, CO+HCl
- 38. A Friedel-Crafts reaction of benzene with chloroform produces:

(a)
$$C_6H_5CHCl_2$$
 (b) $C_6H_5 - C - C_6H_5$ H

(c) $C_6H_5 - C - C_6H_5$ (d) all of these

39. Identify the product obtained in the following reaction:

40. Product of the given reaction:

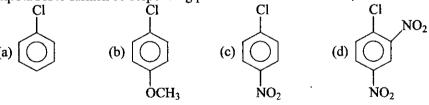
(c)
$$CH_2-CH_2-C-CH_3$$

(d) CH_2-CH_2-C

41. Consider the following reaction

the major product is expected to be:

42. Which one of the following compounds undergoes hydrolysis most readily by aq. NaOH to furnish corresponding phenol?



43. Consider the following sequence of reaction

$$C_6H_5NH_2 \xrightarrow{Ac_2O} A \xrightarrow{Conc. HNO_3} B \xrightarrow{aq. H_2SO_4} C$$
(Major)

(c) [

 $\dot{N}O_2$

(d)

46.
$$OCH_3$$

$$AlCl_3$$
 Δ

Identify A in the reaction:

47. 2
$$\longrightarrow$$
 + CCl₃ \longrightarrow C \longrightarrow H $\xrightarrow{\text{H}_2\text{SO}_4}$ \longrightarrow P; Identify P in the reaction:

(b)
$$Cl$$
— CH_2 — CH_2 — Cl

(c)
$$Cl$$
 CCl_3 C

48.
$$(KSH \rightarrow Y; Identify Y in this reaction :$$

NO₂ SH Cl

49. Identify correct product of the following reaction :

(d) none of these

 $\xrightarrow{\text{Mg}} A \text{; Identify } A:$

51.
$$O_2N$$
 — CH_2 — $CI + NaS$ — CI — CH_2 — CI — CI

Find out missing reagent Y:

O

(a) Sn + HCl

52.

(c)

Br

- (b) Li + HCl
- (c) $C + CCl_4$
- (d) Na + Ether

$$(a) \xrightarrow{Br_2 + Fe} Z; Identify Z:$$

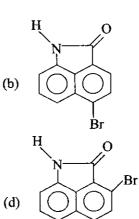
$$(b)$$

$$Br$$

$$H$$

$$O$$

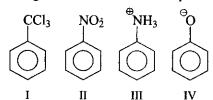
$$N$$



product of this reaction will be:

(d)
$$O_2N$$
— O — C — C

- (a) electrophilic addition
- (b) benzyne intermediate
- (c) nucleophilic aromatic substitution (d) oxirane
- 55. In which of the following cases nitration will take place at m-position:



(a) I only

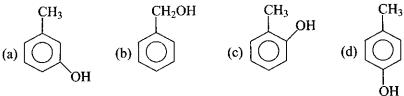
(b) II, III and IV

(c) I, III and IV

(d) I, II and III

56. The major product formed in the following reaction

57. The structure of compound that gives a tribromo derivative on treatment with bromine water is:



58. In the reaction

$$\begin{array}{c|c}
NO_2 & NO_2 \\
& & X \text{ is :} \\
& & Br
\end{array}$$

(a) H_3PO_2

(b) Cu₂Cl₂

(c) HgSO₄/H₂SO₄

(d) H^{\oplus}/H_2O

59. In the following reaction

$$\begin{array}{c}
\text{NO}_2 \\
\text{NO}_2 \\
\text{H}_2\text{SO}_4
\end{array}$$
'X'

the structure of major product 'X' is:

(a)
$$O_2N$$
 O_2N O_2

60. CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3 CH_3

$$CH_3$$
 CH_3
 CC
 CH_3
(d) none of these

61. Reactivity order of the following towards Na OEt, Et OH:

$$\begin{array}{c|cccc} Cl & Cl & Cl & NO_2 \\ \hline \\ NO_2 & NO_2 & NO_2 \\ I & II & III \end{array}$$

- (a) II > I > III (b) I > III > II (c) II > III > I
 - (c) II > III > I (d) III > II > I CH₃
- 62. Ozonolysis of the following compound will produce; is:

63. Which of the following will be obtained by the bromination of ethylbenzene in presence of light?

$$(a) \begin{picture}(20,10) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0$$

64. The major product formed in the reaction

(a)
$$COCl$$
 $AlCl_3, H_2O$ is:

(b) $CCCl$ $CCCCl$ $CCCCl$ $CCCC$ $CCCC$ $CCCC$ CCC CC C

- (d) none of the above
- 65. Consider the following sequence of reactions:

$$F \longrightarrow NO_2 \xrightarrow{\text{Me}_2\text{NH}} X \xrightarrow{\text{1. Sn + HCI}} Y$$

$$\longrightarrow NO_2 \xrightarrow{\text{DMF}, \Delta} X \xrightarrow{\text{1. Sn + HCI}} X$$

$$\xrightarrow{\text{2. NaNO}_2 + \text{HCI}} X$$

$$\xrightarrow{\text{3. H}_3\text{PO}_2} Y$$

the product Y is:

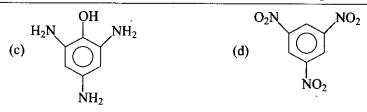
Me

(d)
$$O_2N$$
 \longrightarrow F Me

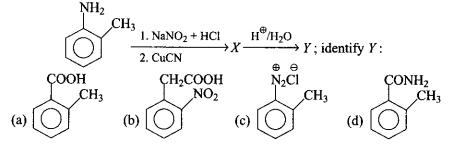
$$\xrightarrow{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4, \, \Delta} A \xrightarrow{\text{NaOH} + \text{CaO}, \, \Delta} B \text{ ; identify } B :$$

$$O_2$$
 O_2
 O_2
 O_2
 O_3
 O_2
 O_3
 O_4
 O_2

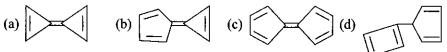
$$\begin{array}{c|c} COOH \\ O_2N & NO_2 \\ \hline \\ NO_2 \end{array}$$



67. Consider the following sequence of reactions



68. Which of the following molecules is expected to have the greatest resonance stabilisation?



69. Arrange the following groups in order of decreasing o-and p-directing strength:

$$-NH_2$$
, $-Cl$, $-OH$, $-R$

(a) —C1>OH>—
$$R$$
>—NH₂

(b)
$$-NH_2 > -R > -C1 > -OH$$

(c)
$$-NH_2 > -OH > -CI > -R$$

(a) —Cl>OH>—
$$R$$
>—NH₂ (b) —NH₂>— R >—Cl>—OH (c) —NH₂>—OH>—Cl>— R (d) —NH₂>—OH>— R >—Cl

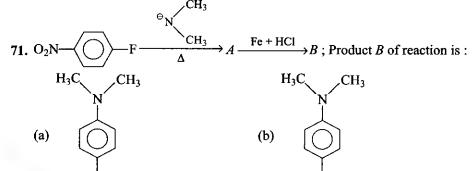
70. Arrange the following groups in order of decreasing electron attracting capacity:

(a) NO₂ > COOH > Cl > OH

 NO_2

- (b) Cl>OH>NO2>COOH
- (c) OH>Cl>NO2>COOH
- (d) NO₂ > COOH > OH > Cl

 NH_2



$$(c) \begin{picture}(60,0) \put(0,0){\oolive{1.5ex}} \put(0,0){\oolive{1.$$

72. Identify product obtained by following sequence of reactions:

$$\begin{array}{c|c}
Cl & & & & & & & & \\
Br & & & & & & & \\
\end{array}$$
(b) Br C

(c)
$$Br$$
 Cl (d) Br Cl I

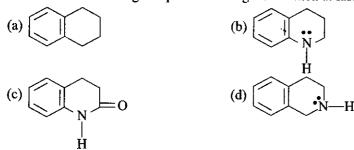
73.
$$(CH_3CO)_2O \rightarrow A \xrightarrow{HNO_3} B \xrightarrow{H^{\oplus}/H_2O} C$$
; Identify C :

(d)

74.
$$CH_3$$

$$\xrightarrow{HNO_3} X \xrightarrow{Zn (Hg)} Y; Identify 'Y':$$

75. Which of the following compounds undergoes nitration at fastest rate?



- - (a) $C_6H_5Br + HNO_3$ and H_2SO_4
 - (b) $C_6H_5NO_2 + Br_2$, FeBr₃
 - (c) $C_6H_5Br + H_2SO_4$, Δ
 - (d) $C_6H_5NO_2 + HBr$

77. Which sequence of steps describes the best synthesis of compound

78. How many benzylic hydrogens are present in the hydrocarbon shown?



(a) 3

(b) 5

(c) 4

(d) 6

79. For this reaction? C_6H_5 ; The best reactants are :

(a)
$$C_6H_5Cl+C_6H_5$$
—C—Cl, AlCl₃

- (b) $C_6H_5 C CH_3 + Cl_2$, FeCl₃
- (c) C₆H₅—CH₂—C₆H₅ +Cl₂, FeCl₃ followed by oxidation
- (d) none of these yield the desired product

80. H_3C \longrightarrow ? Identify the major product :

(a)
$$H_3C$$
 \longrightarrow O_2 O_2 O_2 O_2 O_3 O_4 O_4 O_2 O_4 O_5 O_5 O_6 O_7 O_8 O_8 O_9 O

81. Birch reduction of nitrobenzene will produce:

82. Birch reduction of aniline will produce:

83. Most stable carbocation is:

(a)
$$O_2N$$
 — CH_2 (b) CH_2 — CH_2 (c) CI — CH_2 (d) CH_3 CH_2

84. Aniline when diazotised in cold and then treated with dimethyl aniline gives a coloured product. Its structure would be:

85. Rank the following compounds in order of decreasing reactivity for bromination:

$$C_6H_5$$
— $\overset{\oplus}{\underset{(1)}{\text{N}}}$ Me₃, C_6H_5 — $\overset{\oplus}{\underset{(2)}{\text{CH}}}$ $\overset{\oplus}{\underset{(2)}{\text{N}}}$ Me₃, C_6H_5 — $\overset{\oplus}{\underset{(3)}{\text{N}}}$ NMe₂, C_6H_5 — $\overset{\oplus}{\underset{(4)}{\text{CH}}}$ CH₃

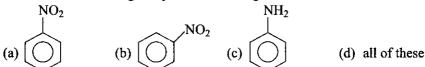
(a) 3 > 4 > 2 > 1

(b) 1 > 3 > 4 > 2

(c) 3 > 4 > 1 > 2

(d) 4 > 3 > 1 > 2

86. Which of the following compounds will not give Friedel-Crafts reaction?



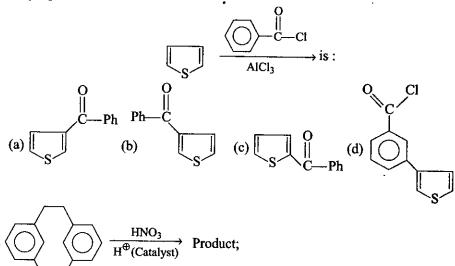
87. Find out correct product of the following reaction:

(a)
$$NH_2$$
 NH_2 NH_3 NH_2 NH_3 NH_2 $NH_$

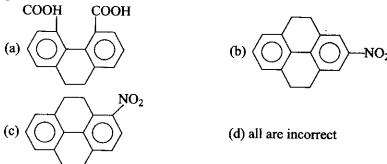
88. Find out correct statement for this reaction:

$$CH_3 \\ Br \\ \frac{\text{NH}_2}{\text{NH}_3}$$

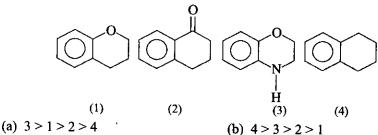
- (a) compound shows elimination addition reaction
- (b) reaction is addition elimination
- (c) reaction is also known as cine substitution
- (d) no reaction
- 89. Major product form in the reaction



product of the reaction will be:



91. Rank the following compounds in decreasing order of reactivity in electrophilic aromatic substitution reaction:



- (c) 3 > 1 > 4 > 2

(d) 1 > 3 > 4 > 2

92. Give the best reaction sequence for the following transformation:

(a)
$$\xrightarrow{\text{HNO}_3}$$
 $\xrightarrow{\text{SO}_3}$ $\xrightarrow{\text{Fe}}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}^{\oplus}}$ $\xrightarrow{\text{CF}_3\text{CO}_3\text{H}}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HCI}}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HCI}}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{H}_2\text{SO}_4}$ $\xrightarrow{\text{HO}_3}$ $\xrightarrow{\text{HO}_3}$

93. Give the major product of the following reaction;

$$(a) \qquad (b) \qquad (c) \qquad (d) \qquad (d)$$

94. Choose the best sequence of reaction to complete the following reaction: NO_2

(a)
$$\xrightarrow{\text{Cl}_2}$$
 $\xrightarrow{\text{FeBr}_3}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{H2SO}_4}$ (b) $\xrightarrow{\text{NO}_2\text{BF}_4}$ $\xrightarrow{\text{FeBr}_3}$ $\xrightarrow{\text{En-Hg}}$ $\xrightarrow{\text{Cl}_2}$ $\xrightarrow{\text{AlCl}_3}$ $\xrightarrow{\text{CF}_3\text{CO}_3\text{H}}$

96. Give the major product of following reaction:

$$(a) \overbrace{\qquad \qquad \qquad \qquad } ?$$

$$(b) \overbrace{\qquad \qquad \qquad } (b) \overbrace{\qquad \qquad } (c) \overbrace{\qquad \qquad } (d) \overbrace{\qquad \qquad } (d) \overbrace{\qquad \qquad } (d)$$

97. Which is the best way to prepare m-bromoaniline?

(a) Aniline
$$\xrightarrow{\text{H}_2\text{SO}_4} \xrightarrow{\text{Br}_2} \xrightarrow{\text{H}^{\oplus}/\text{H}_2\text{O}}$$

(b)
$$\stackrel{Br_2}{\longrightarrow} \xrightarrow{HNO_3} \xrightarrow{Fe + HCl}$$

(c) $\stackrel{NO_2}{\longrightarrow} \xrightarrow{H_2SO_4} \xrightarrow{H_2SO_4} \xrightarrow{NaNO_2 + HCl} \xrightarrow{Cu Br} \xrightarrow{Fe + HCl}$

(d) $\stackrel{NO_2}{\longrightarrow} \xrightarrow{H_2SO_4} \xrightarrow{NaOH} \xrightarrow{NaBr} \xrightarrow{Cu + HCl} \xrightarrow{Fuse}$

98. Select the final product of following sequence of reaction:

(a)
$$\langle \bigcirc \rangle$$
 $-N=N-\langle \bigcirc \rangle$ $-OH$

(c)
$$\langle O \rangle$$
 $N=N-\langle O \rangle$

$$(d)$$
 COOH $N=N-(O)$ OH

99. $A(C_{10}H_{14}) + Cl_2$, $\Delta \longrightarrow C_{10}H_{13}Cl$ (one isomer) $A + Cl_2 / FeCl_3 \longrightarrow C_{10}H_{13}Cl$ (two isomers)

Possible structure of A is:

(b)
$$CH_3$$
 CH_3 CH_3 CCH_3 CH_5 CH_5

100. A compound 'A' (C₇H₈O) is insoluble in water, dilute HCl and aqueous NaHCO₃ but soluble in dilute NaOH. When A is treated with Br₂—H₂O, it is converted into a compound of formula C₇H₅OBr₃. Compound A is:

101. The major product of reaction,

$$CH_{3}$$

$$CH_{4}$$

$$CH_{2}$$

$$C$$

Conversion of A into mixture of B and C by action of heat is an example of:

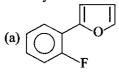
- (a) Claisen rearrangement
- (b) Cope elimination
- (c) Fries rearrangement
- (d) Benzidine rearrangement

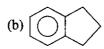
A. L.

103. Consider the following sequence of reactions:

$$\begin{array}{c|c}
& \text{Br} & \text{Mg} \\
\hline
& \text{THF}, \Delta
\end{array}
 X \xrightarrow{O} Y$$

Identify 'Y'.

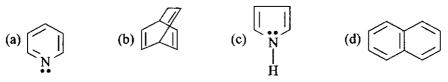




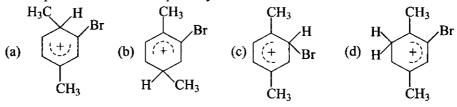
104. Predict major product in the following reaction,

- 105. What function does HNO₃ serve in reaction of benzene with I₂ to produce iodobenzene?
 - (a) The HNO₃ convert the I^{Θ} to I_2 (b) HNO₃ serve as catalyst
 - (c) HNO₃ convert I₂ to HI
- (d) HNO₃ convert I₂ to I[⊕]
- 106. Find out correct product of following reaction:

107. Which of the following compounds would not be considered aromatic in its behaviour?



108. Which of the following structure most closely represent as intermediate in the electrophilic bromination of *para*-xylene?



109. Which of the following compounds form *ortho*-benzenedicarboxylic acid when oxidized by hot aqueous KMnO₄?

110. Electrophilic bromination of p-toluene sulphonic acid, followed by heat with 50% H₂SO₄ produces ortho-bromotoluene. Which of the following intermediate leads to this product?

$$(a) \begin{tabular}{c} H_3C & H \\ SO_3H & (b) & (+) \\ SO_3H & (c) & (+) \\ SO_3H & (d) & (d) & (d) \\ SO_3H & (d) \\ SO$$

111. Which of the following is the major product from the sulphonation of α -tetralone?

$$\begin{array}{c}
O \\
\hline
 & H_2SO_4 \\
\hline
 & \Delta
\end{array}$$

112. Which of the following is the major product from bromination of *meta*-nitrobenzene sulphonic acid?

SO₃H
NO₂

$$\xrightarrow{Br_2, FeBr_3}$$
NO₂
 $\xrightarrow{SO_3H}$
(b)
SO₃H
NO₂
SO₃H
NO₂
 $\xrightarrow{SO_3H}$
NO₂
 $\xrightarrow{SO_3H}$
NO₂
 $\xrightarrow{SO_3H}$
NO₂
 $\xrightarrow{SO_3H}$

113. When Friedel-Crafts alkylation of benzene is carried out with 1 equivalent of *tert*-butyl chloride, a large amount of *para*-di-*tert*-butyl benzene is formed along with monosubstitution product.

Why does not all the benzene react to give *tert*-butyl benzene (the *mono*-substitution product)?

- (a) The tert-butyl substituent activate the benzene ring to further substitution.
- (b) The reaction is bimolecular, so two *tert*-butyl chloride molecule combine with one benzene molecule.
- (c) The tert-butyl substituent is large and favours reaction at para-position.
- (d) The disubstituted product is favoured in equilibrium with mono-substituted ring.
- 114. When para-bromotoluene is treated with NaNH₂ in ether the bromine is lost and mixture of para and meta CH₃C₆H₄NH₂ product is obtain. What kind of intermediate would account for this?
 - (a) A charge delocalised anion formed by nucleophilic addition of NH₂[⊕] to the benzene ring.
 - (b) A charge delocalised anion formed by abstraction of methyl proton by the base NH₂.

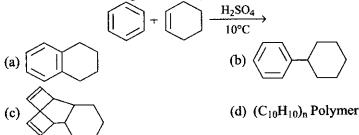
- (c) An aryl cation formed by loss of bromide ion.
- (d) A benzyne species formed by elimination of HBr.
- 115. How might one best accomplish the following synthesis?

$$\stackrel{7}{\longrightarrow} \stackrel{H_2N}{\longrightarrow}$$

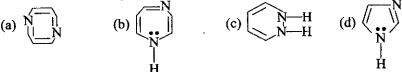
- (a) (i) $C_4H_9 + AlCl_3$
- (ii) HNO₃ and heat
- (iii) excess of H₂ and Pt catalyst

- (b) (i) HNO3 and heat
- (ii) $C_4H_9Cl + AlCl_3$
- (iii) excess of H₂ and Pt catalyst
- (c) (i) C₃H₇COCl + AlCl₃ (ii) HNO₃ and heat
- (iii) excess of H₂ and Pt catalyst

- (d) (i) HNO₃ and heat
- (ii) C₃H₇COCl + AlCl₃ (iii) excess of H₂ and Pt catalyst
- 116. Which of the following is the likely outcome from this reaction?



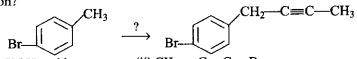
117. Which of the following heterocyclic compound would have aromatic character?



- 118. Which of the following procedure would be the best for preparation of phenyl benzyl ether (C₆H₅OCH₂C₆H₅)?
 - (a) $C_6H_5Cl + C_6H_5CH_2O$
- (b) $C_6H_5\ddot{O} + C_6H_5CH_2$ —Cl

(c) $2C_6H_5Cl + Na_2O$

- (d) $2C_6H_5MgBr + HCHO$
- 119. Which of the following procedures would be best for achieving for following reaction?



- (a) (i) KOH and heat
- (ii) CH_3 — $C \equiv C$ —Br
- (b) (i) KMnO₄ and heat
- (ii) CH_3 — $C \equiv C^{\Theta}$
- (iii) excess H₂O
- (c) (i) NBS in CCl_4 and heat (ii) CH_3 — $C = C^{\Theta}$
- (d) (i) Mg in ether
- (ii) CH_3 — $C = C^{\Theta}$
- (iii) excess H₃PO₄

120. Which of the following carboxylic acid could be resolved reaction with an enantiomerically pure chiral amine?

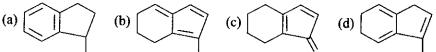
(a)
$$O_2N$$
 O_2N O_2

121. Phenol reacts with acetone in the presence of conc. H_2SO_4 to form a $C_{15}H_{16}O_2$ product. Which of the following compound is this product?

(a)
$$O-C_6H_5$$

(b) $HO-O-Ph$
(c) $O-Ph$

122. Which of the following isomeric hydrocarbon is most acidic?



123. Devise a series of reaction to convert benzene into *meta*-chlorobromobenzene. Select reagent and condition from following table listing them in the order of use

1. Conc. H ₂ SO ₄ Δ	2. Cl ₂ + FeCl ₃ and heat		4. H ₂ , Pt catalyst	5. Mg in ether
6. PBr ₃	7. H ₃ PO ₄	8. HNO ₃ (Conc.) + H ₂ SO ₄ (Conc.)	9. Cu ₂ Br ₂ + HBr	10. (CH ₃ CO) ₂ O + Pyridine.

- (a) 1 then 2 then 6
- (b) 2 then 8 then 4 then 3 then 9
- (c) 8 then 4 then 10 then 2 then 3 then 9
- (d) 8 then 2 then 4 then 3 then 9

124. Iodination of benzene is not easily carried out. How can one prepare para-iodo benzoic acid from p-nitrotoluene?

(a) (i) Br ₂ + F	FeBr ₃ (ii)	Mg in ether, CO ₂		3H ₂ and Pt Catalyst	(iv)	HNO ₂ 0°C	(v)	KI solution
(b) (i) NBS in and He		NaI in acetone	(iii)	3H ₂ and Pt catalyst	(iv)	HNO ₂	(v)	H ₃ PO ₂
(c) (i) NBS in and He		HNO ₂ , 0°C	(iii)	CuBr + HBr	(iv)	KMnO ₄ , Δ	(v)	KI solution
(d) (i) KMnO Heat	4 and (ii)	Sn + HCl	(iii)	$\mathrm{HNO}_2, \ 0^{\circ}\mathrm{C}$	(iv)	KI solution		

- (a) Grignard reagent forms dihalobenzene, adds to anthracene, followed by nucleophilic displacement of flourides anion to form the product.
- (b) Mg reduces anthracene to a reactive dianion that bonds to the dihalobenzene.
- (c) A Grignard reagent forms the dihalobenzene, metalates the anthracene and this nucleophile adds to the remaining fluorobenzene.
- (d) A Grignard reagent forms the dihalobenzene, decomposes to benzyne, which then cycloaldols to anthracene.
- 126. The insecticide DDT (C₁₄H₉Cl₅) is prepared by heating chlorobenzene with chloral (CCl₃CHO) in the presence of conc. H₂SO₄. Which of following compounds is DDT?

(a)
$$CHCl_2$$

(b) $CHCl_2$

(c) $CHCl_2$

(d) $CHCl_2$
 $CHCl_2$
 $CHCl_2$
 $CHCl_2$

127. Which of the following procedure would be best for achieving the following reaction?

$$CH_3$$
 $?$ O_2N $COOH$ B_r

- (a) (i) $Br_2 + FeBr_3$
- (ii) KMnO₄ and Heat
- (iii) HNO₃ and H₂SO₄

- (b) (i) KMnO₄ and Heat
- (ii) $Br_2 + FeBr_3$
- (iii) HNO3 and H2SO4

- (c) (i) NBS in CCl₄ and Heat (ii) KMnO₄ and Heat
- (iii) HNO₃ and H₂SO₄
- (d) (i) NBS in CCl₄ and Heat (ii) NaNO₂
- (iii) KMnO₄ and Heat



128. Compound A ($C_{10}H_6$) liberate 2 mole of CH_4 when treated with MeMgBr. On heating with KMnO₄ solution, A produces benzene dicarboxylic acid which on mononitration produces only one product and no other isomers. 'A' can be:

129. Which of the following alcohols would you expect to form carbocation most readily in H₂SO₄?

130. Which of the following compounds will not rearrange on heating with AlCl₃?

131. Which product is formed at the end of following reaction? H_3C_{\setminus}

CHCl₃, NaOH

(c)
$$H_3C$$
 Θ_{Na} Θ (d) Cl H_3C Θ_{Na}

132. The product (Y) of the following sequence of reaction would be:

Me OH
$$(i) CHCl_3 + NaOH, \Delta \atop (ii) H_3O$$
 $(X) \xrightarrow{Br_2/Fe} (Y)$

(a) Me OH (b) Me OH

(c) Br CHO

(d) Br CHCl₂

133. Consider the following reaction, and select correct statement:

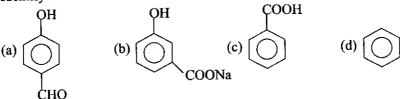
Me
$$\begin{array}{c}
1. \text{ H}_2\text{O} + \text{CH}_3\text{COOAg} \\
2. \text{ H}_2\text{O} + \text{AgF} \\
3. \text{ H}_2\text{O} + \text{AgNO}_3 \\
4. \text{ H}_2\text{O} + \text{AgOH}
\end{array}$$

- (a) only one product will be formed in each of these reaction.
- (b) the rate of reaction remains the same in all the reactions.
- (c) there will be 100% racemisation in all reactions.
- (d) the rate of reaction will be twice in 2nd reaction if conc. AgF is doubled.

135.
$$\begin{array}{c|c}
O_{2}N & & & \\
O_{2}N & & & \\
O_{2}N & & & \\
O_{2}N & &$$

$$(c)$$
 (d) none of these

139. An organic compound A on treatment with $CHCl_3$ and KOH gives B and C, both of which, in turn, give the same compound D when distilled with Zn dust. Oxidation of D yields E of the formula $C_7H_6O_2$. The Na salt of E on heating with soda lime give F which can also be obtained by distilling A with Zn dust. Identify F.



140. Compound A (C_7H_7Cl) react with aq. KOH at room temperature and give compound D (C_7H_8O). Another isomer B gives only one mononitration product on treatment with $HNO_3 + H_2SO_4$ mixture. Isomer C give compound E ($C_7H_5O_2Cl$) on heating with KMnO₄ solution. E gives 3-chloro-4-nitrobenzoic acid as major product. Identify compound D.

(a)
$$Cl$$
 CH_2OH Cl CH_2OH Cl CH_3 (c) CH_3 $COOH$

141. Arrange the following in decreasing order of reaction with Cl₂/AlCl₃:

(a)
$$Q > R > P$$

(c) $R > Q > P$
(d) $R > P > Q$
H

(EH)

(B) $P > Q > R$
(d) $R > P > Q$

Identify the position where, EAS reaction can take place:

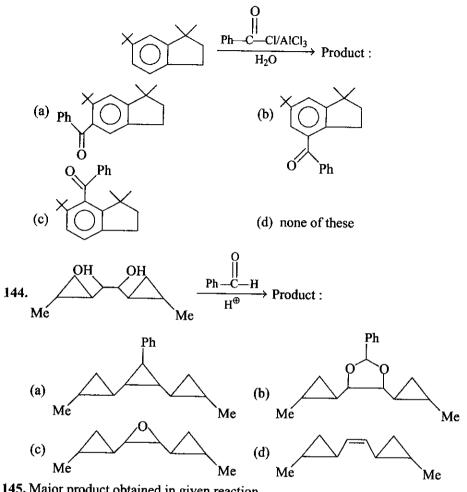
(a) 1

(b) 2

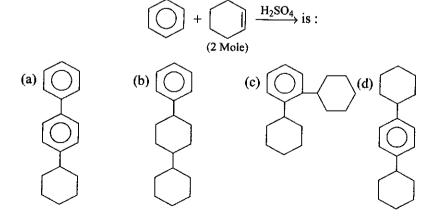
(c) 3

(d) 4

143. The major product of the reaction is:



145. Major product obtained in given reaction



146.
$$AlCl_3/H_2O \rightarrow A \xrightarrow{Conc. H_2SO_4} B \xrightarrow{Cl_2 + H_2O} C \xrightarrow{OH} D$$

The product D is:

147.
$$CH_2$$
 CH_2
 CH_3
 CH

(b)
$$CH_2$$
 $COOC$
 CH_3
 NH_2

148.
$$Cl$$

$$Cl \xrightarrow{C_2H_5ONa^{\oplus}} Product:$$

(a)
$$OC_2H_5$$

•

OH

 CH_3

GRB Advanced Problems in Organic Characteristics
$$OC_2H_5$$
 OC_2H_5 OC_2H

 NH_2

$$(a) \bigvee_{Cl} C = C - \bigcirc \qquad (b) \bigvee_{Cl} C = C - \bigcirc \qquad (b) \bigvee_{Cl} C + C = C - \bigcirc \qquad (c) \bigvee_{Cl} C + C = C - \bigcirc \qquad (d) \bigvee_{Cl} C + C = C - \bigcirc \qquad$$

 $\dot{N}H_2$

$$NO_2$$
 $O-N=N-Ph$
 $HN-N=N-Ph$
 NH_2

154. Which is the best synthesis of O O O O

(a)
$$O \longrightarrow NO_2 \xrightarrow{N_2O_5}$$

$$O \longrightarrow NO_2 \xrightarrow{N_2O_5}$$
(b) $O \longrightarrow NO_2 \xrightarrow{NO_2}$

$$O \longrightarrow NO_2 \xrightarrow{NO_2}$$

(c)
$$H_3C$$
 $+$ NO_2 \longrightarrow NO_2

(d) all are incorrect

155. Which is best synthesis of \longrightarrow H₃CO \longrightarrow NO₂

(a)
$$\xrightarrow{\text{Br}_2} \xrightarrow{\text{HNO}_3} \xrightarrow{\text{HNO}_3} \xrightarrow{\text{HNO}_3} \xrightarrow{\text{CH}_3 \text{ONa}} \xrightarrow{\text{CH}_3 \text{ON a}} \xrightarrow{\text{CH}_3 \text{OH}}$$

(b)
$$\xrightarrow{\text{HNO}_3} \xrightarrow{\text{HNO}_3} \xrightarrow{\text{HzO}_4} \xrightarrow{\text{FeBr}_3} \xrightarrow{\text{CH}_3 \text{ONa}} \xrightarrow{\text{CH}_3 \text{ON}}$$

(c)
$$\xrightarrow{\text{HNO}_3}$$
 $\xrightarrow{\text{Br}_2}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{CH}_3 \text{ONa}}$ $\xrightarrow{\text{CH}_3 \text{ONa}}$ $\xrightarrow{\text{CH}_3 \text{ON}}$ (d) $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{Br}_2}$ $\xrightarrow{\text{Br}_2}$ $\xrightarrow{\text{Na OCH}_3}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{HNO}_3}$ $\xrightarrow{\text{FeBr}_3}$ $\xrightarrow{\text{CH}_3 \text{OH}}$ $\xrightarrow{\text{H2SO}_4}$

156. Which of the following correctly ranks the aryl halides in increasing order of reactivity toward $CH_3O^{\Theta}Na^{\oplus}$ in CH_3OH ?

Br F NO₂ NO₃ Product:

(a)
$$H_3C$$
 H_3C $H_$

158. Find final product of the following reaction:

$$(a) \xrightarrow{Br_2} \xrightarrow{Cu + HCl} \xrightarrow{HNO_3} \xrightarrow{KMnO_4} ?$$

$$COOH \qquad COOH \qquad COOH \qquad CH_3 \qquad Br$$

$$Br \qquad (b) \qquad Br \qquad (c) \qquad (d) \qquad Br$$

159. Find the final product of following sequence of reactions:

$$(a) \xrightarrow{\text{CH}_3} \xrightarrow{\text{KMnO}_4} \xrightarrow{\text{SOCl}_2} \xrightarrow{\text{Br}_2 + \text{OH}} \xrightarrow{\text{HNO}_2} \xrightarrow{\text{CuBr}}$$

$$(b) \xrightarrow{\text{COCl}} \xrightarrow{\text{CONH}_2} \xrightarrow{\text{NH}_2} \xrightarrow{\text{Br}} \xrightarrow{\text{COCl}} \xrightarrow{\text{COCl}} \xrightarrow{\text{CONH}_2} \xrightarrow{\text{COCl}} \xrightarrow{\text{CO$$

160. Find the final product of following sequence of reactions:

$$(a) \xrightarrow{N_2O_5} \xrightarrow{Sn + HCl} \xrightarrow{CH_3 - C - Cl} \xrightarrow{Br_2} \xrightarrow{H_2O} \xrightarrow{HCl}$$

$$(b) \xrightarrow{Cl} \xrightarrow{NH_2} \xrightarrow{Cl} \xrightarrow{NH_2} \xrightarrow{Cl} \xrightarrow{NH_2} \xrightarrow{NH_2} \xrightarrow{Cl} \xrightarrow{NH_2} \xrightarrow{NH$$

ERCISE-2 MORE THAN ONE CORRECT ANSWERS



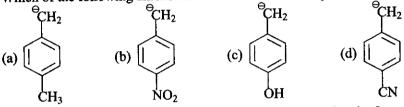
1. Which of the following reactions will produce benzene?



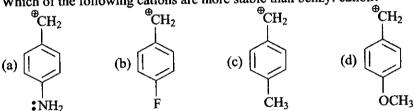
(b)
$$3HC = CH \xrightarrow{Fe \text{ or } Co} \Delta$$

$$(d) \xrightarrow{\bigoplus_{N \in \mathbb{N}} \text{H}_3\text{PO}_2}$$

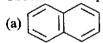
2. Which of the following anions are more stable than benzyl anion?

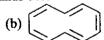


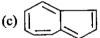
3. Which of the following cations are more stable than benzyl cation?

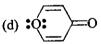


4. Choose the compounds below that are aromatic:









5. Choose the compounds below that are non aromatic:









6. Choose the compounds below that are antiaromatic:

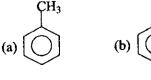








7. Which of the following will undergo Friedel-Crafts alkylation reaction? COOH









- 8. Which pairs are not required for a nucleophilic aromatic substitution reaction?
 - (a) An—NO₂ substituent and a strong electrophile.
 - (b) A ring bearing a strong activating group and a strong acid.
 - (c) An aryl halide with an -NO₂ and a strong nucleophile.
 - (d) An unsubstituted benzene ring and a strong electrophile.
- 9. Halogens are deactivating yet *ortho*, *para* directing in electrophilic aromatic substitution. Which statements do not explain this?
 - (a) A combination of inductive electron withdrawal and resonance electron release.
 - (b) Inductive electron withdrawal with no resonance effect.
 - (c) A combination of inductive electron release and resonance electron withdrawal.
 - (d) A combination of inductive electron release and resonance electron release.
- 10. Which of the following are deactivating but ortho, para directing during electrophilic aromatic substitution reaction?

- 11. Choose the correct statements:
 - (a) all activating groups are ortho, para directing.
 - (b) all deactivating groups are meta directing.
 - (c) directing nature of any group is decided by stability of sigma complex.
 - (d) halogens are deactivating but ortho, para directing.
- 12. Identify the compounds that will undergo nucleophilic aromatic substitution reaction:

(a)
$$O_2$$
 (b) O_2 (c) O_2 (d) O_2 O_2 O_3 O_4 O_4 O_5 O_4 O_5 O_5 O_5 O_6 O_7 O_8 O_8

- 13. Find out correct statements regarding nucleophilic aromatic substitution reaction:
 - (a) there should strong electron withdrawing group at *ortho* and *para* position with respect to leaving group.
 - (b) nucleophilic atom should be of N, S, O, etc.
 - (c) rate of reaction is fastest with fluoro derivative.
 - (d) all are incorrect.

- 14. The reaction produces:

OH (b)

-CH₂I

- CH₂OH
- 15. Which of the following reactions give alkylation product?
- +CH₃COCl AlCl₃
- 16. The following conversion reaction can be carried out by using reaction sequences:

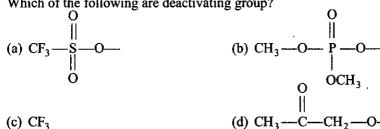
- (d) $KMnO_4/OH/\Delta$
- 17. Iodobenzene can be obtained by:

(a)
$$\bigoplus_{\Theta} + I_2 \longrightarrow$$
 N_2Cl

(c)
$$+ KI \longrightarrow$$

- —СН=СH₂— 18. CH₃O
 - (a) Compound A is CH3-ÇH-CH₃ Br
 - (b) Compound A is CH₃--CH₂----CH₂Br

19. Which of the following are deactivating group?



20. Which of the following are more reactive than diphenyl in electrophilic aromatic substitution reaction?

(a)
$$CH_3$$
 (b) CH_3 (c) CH_3 (d) CH_3

21. Dipole moment of which compound is not zero?

22. Which of the following can be prepared by Reimer-Tiemann reaction directly?

23. Isopropyl benzene can be obtained by:

(a)
$$CH_3$$
— $CH=CH_2$
AlCl₃
CH₃
CH—Cl

(b) CH_3 CH₂CH₂Cl

AlCl₃

CH₃
CH—Cl

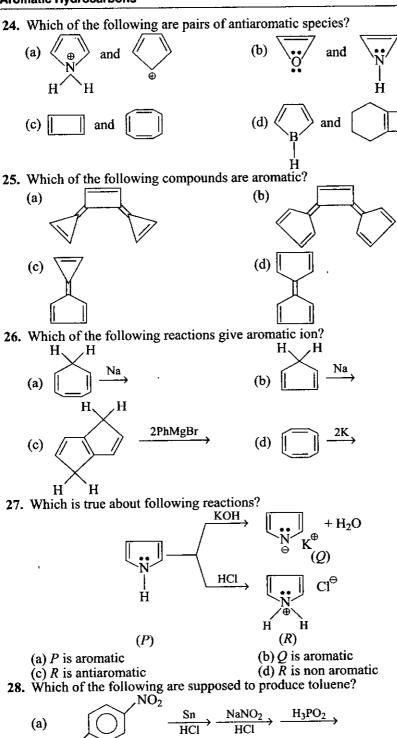
(c) CH_3 CH—Cl

(d) CH_3 CH₂OCH₃
 CH_3 CH

 CH_3 C



 H_3C



29. Which of the following reactions may give benzaldehyde?

(a)
$$+ CO + HCI \xrightarrow{AlCl_3}$$
(b)
$$+ HCN + HCI \xrightarrow{AlCl_3} \xrightarrow{H^{\oplus}/H_2O}$$
(c)
$$\xrightarrow{CH_3Cl} \xrightarrow{KMnO_4} \xrightarrow{LiAlH_4} \xrightarrow{Pcc}$$
O
O
O
Cl
$$\xrightarrow{H_2, Pd - BaSO_4}$$

30. Styrene undergoes following reactions in acidic medium,

$$\begin{array}{c}
\text{CH=CH}_{2} \\
\xrightarrow{\text{Conc. H}_{2} \text{ SO}_{4}}
\end{array}$$

The various intermediate formed are:

31. Which of the following reactions will give identical products?

(a)
$$\xrightarrow{2NBS} \xrightarrow{2KCN} \xrightarrow{H^{\oplus}/H_2O} \xrightarrow{CaO} \xrightarrow{Zn-Hg} \xrightarrow{HCl}$$

(b)
$$\overbrace{ \begin{array}{c} \text{KMnO}_4 \\ \Theta \\ \text{OH, } \Delta \end{array}}^{\text{KMnO}_4} \xrightarrow{\text{SOCl}_2} \xrightarrow{\text{CH}_2\text{N}_2 \text{ (excess)}} \xrightarrow{\text{CaO}} \xrightarrow{\Delta} \xrightarrow{\text{Zn - Hg}}$$

(c)
$$Cl \xrightarrow{AlCl_3} \xrightarrow{N_2H_4, \stackrel{\ominus}{OH}}$$

$$(d) \bigcirc + Br \longrightarrow Br \xrightarrow{AlBr_3} \xrightarrow{2NBS}$$

32. Which of the following sequence of reactions can give

(a)
$$CH_3CI \rightarrow KMnO_4 \rightarrow FeBr_3$$

(b)
$$CH_3Cl \rightarrow Br_2 \rightarrow KMnO_4$$
 $FeBr_3 \rightarrow OH$

(c)
$$\xrightarrow{\text{Br}_2} \xrightarrow{\text{H}_2, \text{Pd} - \text{C}} \xrightarrow{\text{HNO}_2} \xrightarrow{\text{KMnO}_4} \xrightarrow{\text{\Theta}} \xrightarrow{\text{OH}}$$

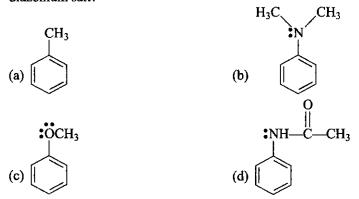
(d) PhMgBr
$$\xrightarrow{CO_2} \xrightarrow{Br_2} \xrightarrow{AlBr_3}$$

33. Which of the following compounds gives faster EAS reaction than benzene?

COOH

34. Which of the compounds give cine substitution products on reaction with NaNH₂ in liquid NH₃?

35. Which of the following compounds can give coupling reaction with benzene diazonium salt?



EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

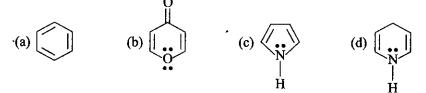
For any compound to be aromatic, compound should follow a given set of rule known as Huckel's rule.

According to Huckel's rule of aromaticity:

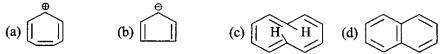
- (a) compound should be cyclic
- (b) compound should be planar and conjugated.
- (c) compound should have $(4n+2) \pi e^{-}$

where $n = 0, 1, 2, 3 \dots$ integer number.

I. Which of the following is not an aromatic compound?



2. Among the following which is a non planar compound?



3. Identify number of delocalised π -electron in pyridine :



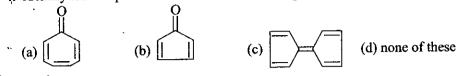
(a) 8

(b) 6

(c) 4

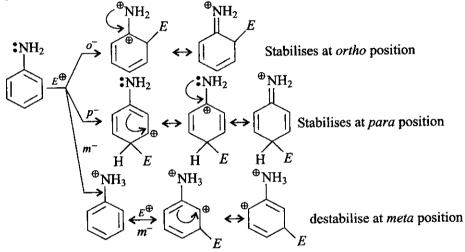
(d) 10

4. Identify the compound which have maximum dipole moment:



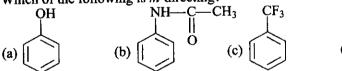
Passage-2

Directing nature of substituted aromatic compound is decided by stability of σ -complex or arenium ion. If σ -complex is stabilise at o-and p-position by attack of electrophile then the group is o-and p-directing but if σ -complex is stabilise at m-position then group will be meta directing.



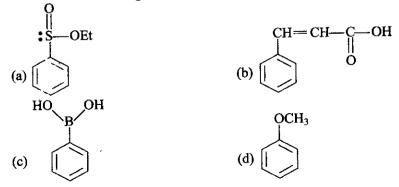
On the basis of above explanation find out correct answers of following questions.

5. Which of the following is m-directing?



(d) Cl

6. Which of the following is not o-and p-directing?



7. Which of the following is o- and p-directing?

$$O = S - OEt \qquad \vdots N = O \qquad O CH_3 \qquad O CH_3$$

$$(a) \qquad (b) \qquad (c) \qquad (d) \qquad (d)$$

Passage-3

If aromatic ring is substituted by more than groups then electrophilic aromatic substitution reaction take place according to more activating group. Types of group which donate electron in aromatic ring known as activating groups.

8.
$$O = C$$

$$O$$

Find out correct product of reaction.

(a)
$$O = C$$
 CH_3
 $O = C$
 $O = C$

Br O—C—CH₃
(c)
$$O = C$$
 CH_3
(d) No reaction

9. Major product formation take place at which position in this reaction:

(a) 3 (c) 6

(d) 4

10. Find out major product of following reaction:

$$(a) \qquad (b) \qquad O_{2}N$$

$$(c) \qquad (d) \qquad O_{2}N$$

Passage-4

A benzene ring deactivated by strong and moderate electron withdrawing group that is, any *meta* directing group, is not electron rich enough to undergo Friedel-Crafts reactions.

$$NO_2 \xrightarrow{R-X} \text{no reaction}$$

Strong deactivation

Friedel-Crafts reaction also do not occur with NH₂ group as it react with AlCl₃ and produce deactivating group.

$$\begin{array}{c}
 & \stackrel{\bullet}{\longrightarrow} & \stackrel{\bullet}{$$

11. Which of the following compounds undergo Friedel-Crafts alkylation reaction?

12. Which of the following cannot be starting material for this compound Ph—C—CH₂—Ph?

13. Which of the following sequence of reaction is correct for the synthesis of product

(a)
$$CH_3$$
— CH_3

(b) CI_2 — CH_3 CH₂CI

AlCl₃

CH₃CH₂CI

FeCl₃

(c) CH_3 — C — CI

AlCl₃
 CH_3 — C — CI

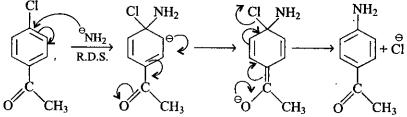
FeCl₃
 CH_3

CH₃

Passage-5

For a typical nucleophilic aromatic substitution reaction to take place.

- 1. Nucleophilic atom should be of oxygen, nitrogen or sulphur.
- 2. Leaving groups should be halide.
- 3. There should be strong electron withdrawing at *ortho* and *para* position to leaving group.



14. Fastest nucleophilic aromatic substitution reaction take place in :

(a)
$$(b)$$
 (c) (d) (d)

15. Find out correct product of following reaction:

$$(a) \begin{picture}(200,0) \put(0,0){\line(1,0){100}} \put(0,0){\line(1,0$$

16. Compare rate of nucleophilic aromatic substitution reaction in following reactants:

Cl Cl NO₂ NO₃ (a)
$$S > Q > P > R$$
 (b) $R > S > P > Q$ (d) $P > S > R > Q$

Passage-6

Examine given sequence of reactions carefully:

$$\begin{array}{c}
NO_2 \\
\hline
Sn + HCI \\
\hline
A & HNO_2 \\
\hline
B & H_2O \\
\hline
C & Conc. H_2SO_4 \\
\hline
100°C
\end{array}$$

$$D \xrightarrow{Br_2 + FeBr_3} E$$

- 17. Conversion of B to C is which type of reaction?
 - (a) electrophilic aromatic substitution reaction
 - (b) nucleophilic aromatic substitution reaction
 - (c) free radical substitution
 - (d) nucleophilic acyl substitution reaction
- 18. Formation of A from nitrobenzene cannot be achieved from:
 - (a) Zn + HCl

(b) Fe + HCl

(c) NaBH₄

(d) LiAlH₄

19. Identify product E of the reaction:

Passage-7

' There is a way to reduce benzene derivatives to the corresponding 1, 4-cyclohexadiene known as Birch reduction. It involves treatment of aromatic substrate with two mole of active metal as Li or Na in liquid ammonia/alcohol mixture.

Mechanism:

Li
$$\longrightarrow$$
 Li ^{\oplus} + e⁻

H \longrightarrow H \longrightarrow Li

Li

Li

Li

Li

H \longrightarrow H \longrightarrow

20. Predict the product of this reaction:

a)
$$O_2$$

$$\begin{array}{c}
 & 2Li \\
\hline
 & NH_3/ROH
\end{array}$$
(b) O_2
(c) O_2
(d) O_2

21. Find out correct product of the given reaction:

$$\begin{array}{c|c} OCH_3 \\ \hline & 2Na \\ \hline & NH_3/ROH \end{array}$$

$$\begin{array}{c|c} OCH_3 \\ OCH$$

- 22. Why alcohol, rather than ammonia, the proton source during the Birch reduction?
 - (a) Alcohol is more acidic than ammonia.
 - (b) Ammonia and alcohol both have nearly some acidic strength.
 - (c) Ammonia is more acidic than alcohol.
 - (d) All are incorrect.

Passage 8.

Phenolic esters on heating with AlCl₃ (Lewis acid) give ortho and para acyl phenol. This is known as Fries rearrangement.

$$O \longrightarrow C \longrightarrow R \longrightarrow OH O \longrightarrow R + \bigcirc R$$

$$AlCl_3 \longrightarrow AlCl_3 \longrightarrow R + \bigcirc R$$

In general, low temperature favours the para product and high temperature favours ortho product.

Mechanism:

If one of the *ortho* position is substituted by any group then *para* is the major product.

OCOMe
$$\xrightarrow{\text{AlCl}_3}$$
 Major product :

25.
$$COOH$$

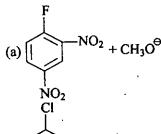
$$CH_3-C-Cl \rightarrow AlCl_3 \rightarrow H_2O$$

EXERCISE-4 MATRIX MATCH TYPE

Column matching problems. Each column may have more than one answer.

1. Column (I)

Column (II)



P. Electrophilic aromatic substitution

+ KNH₂ in liq. NH₃ Q. Reimer Tiemann reaction

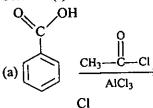
$$(c) \underbrace{\bigcirc + N_2O_5}_{OH}$$

R. Nucleophilic aromatic substitution

S. Cine substitution reaction

2. Column (I)

Column (II)



P. o, p-directing compound

(b) H₃C CH₃ KNH₂ Liq. NH₃

Q. Activated compound

H₃C CH₃

R. No reaction

S. Deactivated compound

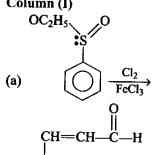
3. Column (I)



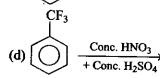




4. Column (I)

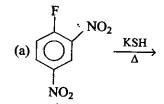


$\begin{array}{c|c} \cdot \text{NH} - \text{C} - \text{CH}_3 \\ \hline \text{(c)} & \xrightarrow{N_2O_5} \end{array}$



5. Column (I)

(b)



Column (II)

- P. Aromatic
- Q. Non aromatic
- R. Tub shape structure
- S. Electrophilic aromatic substitution reaction Column (II)
- P. Ortho and para substitution.
- Q. Meta substitution.
- R. Substitution is faster than benzene.
- S. Substitution is slower than benzene.

Column (II)

P. Nucleophilic aromatic substitution

(b)
$$CI \xrightarrow{KNH_2} CF_3$$

$$CF_3 \xrightarrow{B} NH_3 \xrightarrow{A} C \xrightarrow{O} CI \xrightarrow{H-N} O$$

$$CI \xrightarrow{H-N} A$$

$$O = S = O$$

$$CF_3$$

- Q. Addition elimination reaction.
- R. Elimination addition reaction.
- S. Benzyne intermediate.

EXERCISE-5 INTEGER ANSWER TYPE PROBLEMS

1. Identify number of substituents those are deactivating but ortho and para directing.

$$-\ddot{F}:, -CF_{3}, -\ddot{C}-NH_{2}, -CH=CH-\ddot{C}-H, -CH=CH-\ddot{C}-OH$$

$$0$$

$$-\ddot{B}-C_{2}H_{5}, -\ddot{S}-C_{2}H_{5}, -\ddot{N}=0, -\ddot{C}-NH_{2}$$

2. Each of the compounds shown below has two aromatic ring, labled as A and . Identify number of compounds in which ring B is more active than ring A for electrophilic aromatic substitution reaction.

$$CH_3$$
 B
 A
 C
 B
 CH_3
 B
 A
 B
 A
 B
 A
 B

3. Examine the structural formulas shown below and find out how many compounds undergo electrophilic nitration more rapidly than flouro benzene.

4. Identify number of reactions that can give nucleophilic aromatic substitution products.

5. Identify number of reactions that can give benzene as major product. OH

(a)
$$3 \text{ H} - C \equiv C - H \xrightarrow{\text{Fe or CO}} \Delta$$
 (b) $\stackrel{\text{EB}}{\longrightarrow} N$

(c) $\stackrel{\text{NaBH}_4}{\longrightarrow} \Delta$ (d) $\stackrel{\text{NaOH} + CaO}{\longrightarrow} \Delta$ (e) $\stackrel{\text{H}_3PO_2}{\longrightarrow} \Delta$

$$(f) \begin{picture}(60,0) \put(0,0){\ootalign{\hfill \hfill \hfill$$

(i)
$$\frac{Pd-C}{\Delta}$$

6. Examine the structural formulas shown below and find out how many compounds can not, give Friedel Crafts reaction.

7. Examine the structural formulas shown below and find out how many compounds will show oxidation reaction with acidic KMnO₄.

$$\begin{array}{c|c} CH_3 & CH_3 & CH=CH_2 & Ph \\ \hline \\ O, & O \\ \end{array}, \begin{array}{c} CH_3 & CH=CH_2 & Ph \\ \hline \\ O, & O \\ \end{array}, \begin{array}{c} Ph \\ O \\ \end{array}$$

8. Identify number of reactions that would give salicylic acid as major product.

9. Find out number of reactions that are electrophilic aromatic substitution in nature.

(a)
$$NO_2$$
 NO_2 $NO_$

(e)
$$\longrightarrow$$
 COO \longrightarrow HBF₄ \longrightarrow (f) \longrightarrow Br₂ +Fe \longrightarrow (g) \longrightarrow CuCN \longrightarrow

10. Examine the structural formulas shown below and identify how many compounds will show coupling reaction with diazonium salts faster than anisole (Ph—O—CH₃).



ANSWERS



Exercise-1: Only One Correct Answer

I o	vel-	1															,		
Le	VCI-	· =										,		~ · · · · · · · · · · · · · · · · · · ·		·,···			
1.	(b)	2.	(c)	3.	(c)	4. (d)	5. (c) €	3. (b)	7	'. (b)	8	. (a)	9). (a)	10.	(b)
11.	(c)	12.	(c)	13.	(b)			5. (b				(c)	18	· (d)	19). (b)	20.	(a)
21.	(c)	22.	(c)	23.	(a) ²	24. (a) 2	5. (b) 2€	6. (d)	27	' (b)	28	(c)	25). (b)	30.	(c)
31.	(a)	32.	(c)	33.	(b) 3	34. (b) 3	5. . (b	38	5. (a)	37	' (d)	38	. (a)	39). (b)	40.	(a,b)
41.	(b)	42.	(b)	43.	(a) 4	44. (c) 4	5. (c) 46	5. (c)	47	'. (c)	48	. (b)	49). (d)	50.	(c)
Le	Level-2 1. (a) 2. (c) 3. (b) 4. (a) 5. (c) 6. (b) 7. (b) 8. (c) 9. (a) 10. (c)																		
1.	(a)	2	(c)	3.	(b)	4.	(a)	5.	(c)	6.	(b)	7.	(b)	8.	(c)	9.	(a)	10.	(c)
11.	(c)	12	(b)		(b)		(c)					17.				19.			(d)
21.	(b)	22	. (b)	23.	(ċ)	24.	(a)	25.	(c)	26.	(b)	27.	(b)	28.	(b)	29.	(b)	30.	(c)
31.	(d)					34.	(c)	35.	(b)	36.	(c)	37.	(b)	38.	(a)	39.	(c)	40.	(b)
41.	(b)	42	. (b)	43.	(c)	44.	(d)	45.	(d)	46.	(c)	47.	(a)	48.	(a)	49.	(c)	50.	(b)
Le	Level-3																		
1.	(d)	2	. (a)	3.	. (b)	4.	(b)	5.	(c)	6.	(d)	፞7.	(a)	8.	(c)	9.	(b)	10	. (b)
11.	(b)	12	(b)	13.	. (d)	14.	(c)	15.	(b)	16.	(c)	17.	(d)	18.	(a)	1 9 .	(c)	, 20	. (c)
21.	(d)	22	. (a)	23.	. (a)	24.	(c)	. 25.	(b)	26.	(d)	27.	(d)	28.	(g)	29.	(a)		، (d)أ
	(d)	32	. (d)		. (b)		(b)	35.		3 6 .	(a)	37.	(c)	38.			(a)) (a)
	(b)		- (d)		(c)		(c)	45.		46,		47.		48.		49.			· (d)
	(a)		. (a)		(d)		(c)	55.		56.		57.		58.			(b)		· (c)
	(d)		(a)		· (d)		(b)			66.		67 .		68.		69.			· (a)
	(b)		· (a)		(b)		, (c)	75.		76.		77.		78.			(b)		. (c)
	(c) (c)		. (d) . (d)		· (d) · (d)		(c)	85. 95.		86.		87. 97				89.			(b)
	٠,						(c)	105.											(a)
								115.											
			, ,					125.											
								135.											
								145.				•							
								155.											

Exercise-2: More Than One Correct Answers

1.	(a, b, d)	2.	(b, d)	3.	(a, c, d)	4.	(a, c, d)	5.	(a, b, d)	6.	(a, b, c)
									(a, c, d)		
13.	(a, b, c)	14.	(b, c)	15.	(a, c, d)	16.	(b, c, d)	17.	(b, c)	18.	(a, d)
19.	(a, b, c)	20.	(a, b, d)	21.	(a, c)	22.	(a, b, c)	23.	(a, b, c)	24.	(b, d)
									(a, b, c, d)		
<u>31.</u> _	(a, b, c).	32.	(b,_c)	3,3,_	(a, b, d)	34,	(a, b, d).	<u>35.</u>	(b <u>, c)</u>		

Exercise-3 : Linked Comprehension Type

ſ	1. (d)	2. (c)	3. (b)	4. (a)	5. (c)	6. (c)	7. (b)	8. (a)	9. (b)	10. (c)
I	11. (c)	12. (c)	13. (c)	14. (a)	15. (b)	16. (c)	17. (b)	18. (c)	19. (a)	20. (b)
L	21. (d)	22. (a)	23. (b)	24. (c)	25. (a)					

Exercise-4: Matrix Match Type

EXCIDISC 4. IIIGIIIX					
1. (a) $\rightarrow R$;	(b) $\rightarrow R, S$;	(c) → P;		$(d) \rightarrow P, Q$	Ì
2. (a) $\rightarrow R$, S;	(b) $\rightarrow P, Q, R$;	(c) $\rightarrow P, Q$;		(d) → S	1
3. (a) $\rightarrow Q, R$;	$(b) \rightarrow P, S;$	(c) $\rightarrow Q$;		(d) $\rightarrow P$, $S_{\dot{\tau}}$	1
4. (a) → P, S;	$(b) \rightarrow P, S;$	(c) $\rightarrow P, R$;	a	$(d) \rightarrow Q, S$	ŀ
5. (a) → P. 0;	$(b) \rightarrow P, R, S; \underline{\hspace{1cm}}$	(c) → S;		$(d) \Rightarrow P, O$	┛

Exercise-5: Integer Answer Type Problems

)2, (5)_				



10

between:

Biomolecules



EXERGISES ONLY ONE CORRECT ANSWER

			LE UEV	(35	<u> </u>		
1.	Which of the follow	ving	is not a monosa	icch	aride?		
	(a) Glucose		Fructose		Cellulose	(d)	Ribose
2.	Glucose is:						
	(a) aldopentose	(b)	aidohexose	(c)	ketopentose	(d)	ketohexose
3.	The monomer units	of s	starch are:				
	(a) α - glucose	(b)	β-glucose	(c)	pyranose	(d)	galactose
4.	Which of the follow	ving	is the sweetest	?			
	(a) Glucose	(b)	Fructose	(c)	Maltose	(d)	Sucrose
5.	Maltose is made up	of:					
	(a) α - D - glucose		_		D - fructose		
	(c) α - D - glucose a	•	-		glucose and fru	ictos	se
6.	Which one of the fo	ollov	ving is used to i				_
	(a) Neutral FeCl ₃				CHCl ₃ + KOH		
	(c) C ₂ H ₅ ONa				Ammoniacal A	_	•
7.	The carbohydrate w						
_	(a) starch		glycogen	٠.	cellulose	(d)	all of these
8.	Which of the follow						** 1
	(a) Amylopectin	٠,	•	• •	Cellulose	(d)	Nylon
9.	Glucose reacts with					. 15	
	(a) monoacetate			(c)	penta-acetate	(d)	hexa-acetate
10.	DNA molecule is for						
	(a) pentose sugar,(b) pentose sugar,				lines and nurine	c	
	(c) pentose sugar,					3	
	(d) chloridepentose					s	
11.	Glucos, is hydrolys	_			1,7		
	(a) dicarboxylic ac		., _,	(b)	alcohol		
	(c) amino acids			. ,	aromatic acids		
12.	Which of the follow	ving	monosaccharid	es is	a pentose?		
	(a) Glucose		Fructose		Ribose	(d)	Galactose
13.	Ring structure of g	luco	se is due to for	mati	on of hemiaceta	ıl an	d ring formation

(a) C_1 and C_5 (b) C_1 and C_4 (c) C_1 and C_3 (d) C_2 and C_4

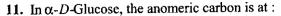
14.	Glucose is:		
	(a) monosaccharide		disaccharide
	(c) trisaccharide	(d)	polysaccharide
15.	Hydrolysis of sucrose is called:		
	(a) esterification	(b)	saponification
	(c) inversion	(d)	hydration
16.	Starch is changed into disaccharide in p	rese	ence of:
	(a) amylase		maltase
	(c) lactase	(d)	zymase
17.	The disaccharide present in milk is:		k
	(a) sucrose	(b)	maltose ·
	(c) lactose	(d)	cellobiose
18.	A carbohydrate which cannot be hydrol	yse	d to simpler compounds is called:
	(a) monosaccharide		polysaccharide
	(c) disaccharide		trisaccharide
19.	Which of the following is not a reducin	e su	gar ?
	(a) Sucrose	-	Galactose
	(c) Glucose	• •	Lactose
20.	How many carbon atoms can be found in		
	(a) 5-6		3-5
	(c) 3-7		1-5
21.	A nucleoside is:	(-,	•
	(a) base + sugar	(h)	base + phosphate
•	(c) sugar + phosphate		base + sugar + phosphate
22.	Hair, finger, nails, hoofs, etc. are all ma		
	(a) fat		vitamins
	(c) proteins		iron
23.	Mark the globular protein in the following		
	(a) Collagen	_	Myoglobin or Haemoglobin
	(c) Myosin		Fibroin
24	The end product of protein digestion is	٠,	
27.	(a) peptides		peptones
	(c) protones		α - amino acids
25	Which one is the complimentary base of	` ′	
2.5.	strand of DNA?	auc	anne in one strand to that in the othe. ني
	(a) Cytosine	(b)	Guanine
	(c) Uracil		Thymine
26	The base present in RNA but not found		-
_~	(a) Thymine		Uracil'
	(c) Adenine		Guanine
27	Calorific value is in the order:	(4)	Guanne
٠,٠	(a) Fats > Protein > Carbohydrates	ሌነ	Corpobudrates > Pate > Destain
	* * *		Carbohydrates > Fats > Protein Protein > Fats > Carbohydrates
	(c) Fats > Carbohydrates > Protein	(a)	riotetti - rats - Carbonydrates

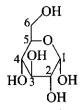
28.	Deficiency of vitamin A results in:	
	(a) scurvy	(b) night blindness
	(c) beri-beri	(d) rickets
29.	Riboflavin deficiency causes:	
	(a) scurvy	(b) pellagra
	(c) beri-beri	(d) cheilosis
30.	A good source of vitamins A and D is	
	(a) whole cereal	(b) cod liver oil
	(c) yeast	(d) water melon
31.	Ascorbic acid is called is:	
	(a) vit. C	(b) vit. A
	(c) vit. D	(d) vit. B
32.	Continuous bleeding from an injured p	art of body is due to deficiency of
	(a) vitamin A	(b) vitamin E
	(c) vitamin B	(d) vitamin K
33.	Cobalt as a rare element is essential in	the synthesis of this vitamin.
	(a) Vitamin C	(b) Vitamin D
	(c) Vitamin B ₁	(d) Vitamin B ₁₂
34.	Scurvy is a disease caused by:	
	(a) a virus	(b) deficiency of vitamin E
	(c) deficiency of ascorbic acid	(d) deficiency of vitamin D
35.	Which pairing is found in DNA?	
55.	(a) Adenine with thymine	(b) Thymine with guanine
	(c) Guanine with adenine	(d) Uracil with adenine
36	AGCT are nitrogenous bases of DNA.	The pairing is:
50.	(a) A—G, C—T	(b) A—T,G—C
	(c) A—C,G—T	(d) A—T,G—T
37	The successive nucleotides of DNA ar	e covalently linked through:
٠.,	(a) peptide bonds	(b) hydrogen bonds
	(c) glycosidic bonds	(d) phosphodiester bonds
38.	Lactose is composed of:	
50.	(a) glucose + glucose	(b) glucose + fructose
	(c) glucose + galactose	(d) fructose + galactose
	(/ 0	
39.	$ \begin{array}{ccc} \text{Glucose} & \xrightarrow{\text{HCN}} & \xrightarrow{\text{Hydrolysis}} & \xrightarrow{\text{HI heat}} \\ \end{array} $	
	(a) hypotonic acid	(b) 2-iodohexane
	(c) heptane	(d) heptanol
	Br ₂ +H ₂ O B 1 4 B 2 4 5	-A:
40	Glucose $\xrightarrow{Br_2+H_2O}$ Product; Product	CI IS:
	(a) glucaric acid	(b) gluconic acid
	(c) hexanoic acid	(d) bromo hexane
41	Number of possible isomers of glucos	e is :
	(a) 16	(b) 14
	(c) 10	(d) 8

(d) D-Fructose and L-Fructose

42.	. Carbohydrates wh	ich differ in configi	uratio	n at the glycos	idic carbon (i.e., C1 in
	aldose and C2 in k	etoses) are called:			
	(a) anomers	(b) epimers			(d) enantiomers
43.		mers that differ only	y in tl	ne configuration	about a single carbon
	atom are called:	(1)			(B)
	(a) anomers	(b) epimers	. ,	conformers	(d) enantiomers
44.	Osazone formation				
	(a) oxidation	(b) reduction	(c)	chelation	(d) hydrolysis
		LE	VEL	-2	
1.	The minimum num	ber of carbon atoms	that s	hould be present	t in a carbohydrate is:
	(a) 2	(b) 3	(c)		(d) 6
2.	Carbohydrates are	commonly defined	as:		,
	(a) Polycarbonyl o	compounds		Polycarboxyli	c acid
	(c) Polyhydroxy c	arboxylic acid	(d)	Polyhydroxy a	ıldehyde and ketone
3.	Carbohydrate that	on attempt hydrolys	sis are	not cleaved to	smaller carbohydrates
	are called:				,
	(a) Monosacchario		(b)	Oligosacchario	de
	(c) Polysaccharide		, ,	Disaccharide	
и.	The number of chir		en ch	ain structure of	glucose is:
	(a) 3	(b) 4	(c)	5	(d) 6
5.	Cane sugar on hydr				
	(a) Glucose and G			Glucose only	
_	(c) Glucose and Fr		(d)	Fructose only	
6.	The carbohydrate p				
_	(a) Sucrose	(b) Maltose		Lactose	(d) Celobios
7.	Which of the follow	ving structures repr	esent	s $lpha$ - D -glucopyr	anose?
	ОН	ОН		ОН	ЮН
	Lo	_О ОН		<u> </u>	
	(a) (OH)	(b) (OH)	(c)		(d) (HO)
	N /	· · N /	(0)		N N
	он но — Тон	но		НОТОН	но он
Q		OH		ÓНОН	ОН
υ.	α-D-Glucopyranose	and p-D-Glucopyr			
	(a) Anomers(c) Diastereomers			Epimer	. 1
9		at is constituted -6:		Meso compour	ods . '
٠.	The disaccharide th (a) Lactose	(b) Maltose		Sucrose unit is:	(d) Diboss
10	Invert sugar is an ed			5461086	(d) Ribose
•	(a) D-Glucose and			D-Glucose and	I_Fructose
			(U)	~ Gracose and	TLI THEIDSE

(c) D-Glucose and L-Glucose





(a) 1

(b) 2

(c) 4

(d) 5

12. In the ring structure of fructose, the anomeric carbon is:

(a) C-1

(b) C-5

(c) C—2

(d) C--6

13. Fructose reduces Fehling's solution due to the presence of:

(a) hydroxy group

(b) aldehyde group

(c) ketone group

- (d) α-hydroxy ketone group
- 14. Which of the following reagents may be used to identify glucose?

(a) Neutral FeCl₃ solution

(b) Ammoniacal AgNO₃ solution

(c) CHCl₃ and KOH (alc.)

(d) NaHSO₃

15. Upon hydrolysis lactose breaks down into:

(a) glucose and mannose

- (b) glucose and fructose
- (c) glucose and galactose
- (d) glucose and arabinose
- 16. Glucose and galactose differ in configuration at:

(a) C—1

(b) C--2

(c) C--3

(d) C-4

17. Which of the following is C-2 epimer of D-Glucose?

(a) D-Galactose

(b) L-Glucose

(c) D-Mannose

(d) D-Fructose

18. Starch is a polymer of:

(a) fructose

(b) glucose

(c) lactose

(d) ribose

19. Glucose when treated with CH_3OH in presence of dry HCl gives α -and β -methylglucosides because it contain:

(a) an aldehydic group

(b) —CH₂—OH group

(c) Five —OH group

(d) None of these

20. Which of the following is a non reducing sugar?

(a) Glyceraldehyde

(b) Glucose

(c) Fructose

(d) Sucrose

- 21. Glycosidic linkage is:
 - (a) an amide linkage

(b) an ester linkage

(c) an ether linkage

(d) an amine linkage

- 22. Pyranose ring consist of a skelton of:
 - (a) 5 carbon atoms and one oxygen atom
 - (b) 6 carbon atoms
 - (c) 6 carbon atoms and one oxygen atom
 - (d) 4 carbon atoms and one oxygen atom

23. Glucose and Fructose can be differentiated by:

(a) Tollen's reagent

(b) Cold KMnO₄

(c) Br_2/H_2O

(d) PCC

24. Periodic acid splits glucose and fructose into formic acid and formaldehyde. Ratio of formic acid and formaldehyde from glucose and fructose is:

(a) 5/1 and 4/2

(b) 5/1 and 3/2

(c) 4/2 and 4/2

(d) 3/2 and 4/2

25. An aldose is converted into its next higher homologue by :

(a) Ruff's method

(b) Amadori rearrangement

(c) Killiani synthesis

(d) Wohl's method

26. The change in optical rotation with time of freshly prepared solution of sugar is known as:

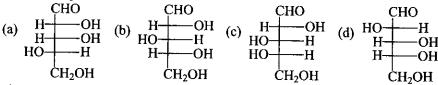
(a) Specific rotation

(b) Mutarotation

(c) Inversion

(d) Rotatory motion

27. Which of the following gives an optically inactive aldaric acid on oxidation with dilute HNO₃ acid?



28. Glucose does not react with:

(a) $C_6H_5NHNH_2$ (b) H_2N-OH

(c) HCN

(d) NaHSO₃

29. Cellulose is a linear polymer of:

(a) α-D-Glucose

(b) β-D-Glucose.

(c) α-D-Fructose

(d) β -L-Glucose

30. Rapid interconversion of α -D-Glucose and β -D-Glucose in solution is known as :

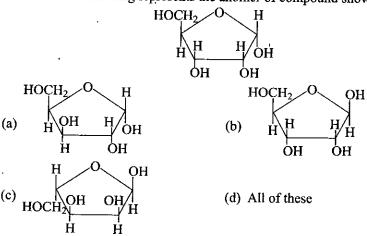
(a) racemisation

(b) asymmetric induction

(c) fluxional isomerisation

(d) mutarotation

31. Which of the following represents the anomer of compound shown?





32.

, the given is enol form of:

CH₂OH

(a) D-Glucose

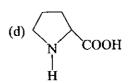
(b) D-Mannose

(c) D-Fructose

- (d) All of these
- 33. The numbers of chiral centers present in glucopyranose and fructofuranose are:
 - (a) 4 and 3
- (b) 5 and 4
- (c) 4 in each
- (d) 5 in each

- 34. Which of the following is an amino acid?
 - (a) H₂N--COOH

(b) CH_3 —CH—COOH $CONH_2$

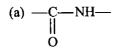


- 35. Amino acids undergo internal acid base reaction to form:
 - (a) an amide
- (b) a lactum
- (c) zwitter ion
- (d) a peptide
- 36. An amino acid usually shows its lowest solubility in water:
 - (a) in acidic solution

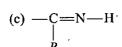
(b) in basic solution

(c) at pH 7

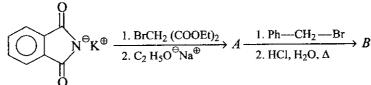
- (d) at isoelectric point
- 37. Which one among following is a peptide linkage?



(b)
$$-N = C - O - C -$$



38. Consider the following sequence of reaction,



The major final product (B) is:

$$\begin{array}{c} \text{NH}_2 \\ | \\ \text{(c) Ph---CH}_2 - \text{CH} - \text{COOH} \end{array}$$

(b) Ph—CH—COOH
$$NH_2$$
 $COOEt$ $COOEt$ NH_2 NH_2

39. Which of the following is the major solute species in a solution of lysine at pH - 10.5.

(a)
$$H_3N \longrightarrow H$$
 (b) $H_2N \longrightarrow H$ (c) $H_2N \longrightarrow H$ (d) $H_2N \longrightarrow H$ (CH₂)₄ (CH₂)₄ (CH₂)₄ (CH₂)₄ (CH₂)₄ H_3 $H_3 \longrightarrow H$ (CH₂)₄ $H_4 \longrightarrow H$

40. Which of the following is the major solute species in a solution of glutamic acid at pH = 1.3.

(a)
$$H_3N$$
 $\stackrel{\oplus}{\longrightarrow}$ H (b) H_2N $\stackrel{\oplus}{\longrightarrow}$ H (c) H_3N $\stackrel{\oplus}{\longrightarrow}$ H (d) H_2N $\stackrel{\oplus}{\longrightarrow}$ H (CH₂)₂ (CH₂)₂ (CH₂)₂ (CH₂)₂ (COOH

- 41. Which of the following statements most correctly defines the isoelectric point?
 - (a) The pH at which all molecular species are ionised and that carry the same
 - (b) The pH at which all molecular species are neutral and uncharge.
 - (c) The pH at which half of the molecular species are ionised and the other half unionised.
 - (d) The pH at which negatively and positively charged molecular species are present in equal concentration.
- 42. Alanine at its isoelectric point, exist in solution as:

(a)
$$H_2N$$
— CH — COO^{\ominus} (b) H_3N — CH — $COOH$ CH_3 (c) H_3N — CH — $COOH$ CH_3 (d) H_2N — CH — $COOH$ CH_3

43.
$$(y)H_3\overset{\oplus}{N} \overset{\oplus}{N}H_3(z)$$

The order of decreasing acidity of these acidic sites is:

(a) x > z > y

(b) z > x > y

(c) x > y > z

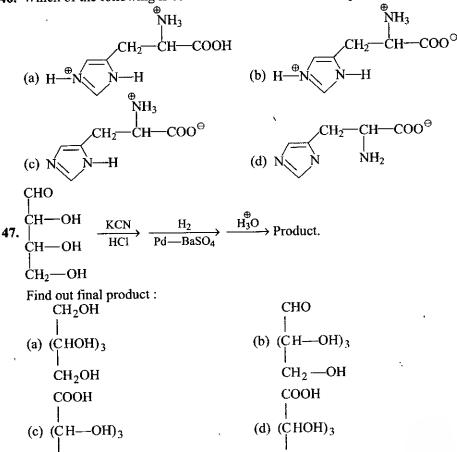
- (d) y>x>z
- 44. Biuret test is used for the detection of:
 - (a) sugar
- (b) proteins
- (c) fats
- d) starch
- 45. α -Amino acids behave as crystalline ionic solid and have high melting point due to the presence of :
 - (a) -NH₂ group

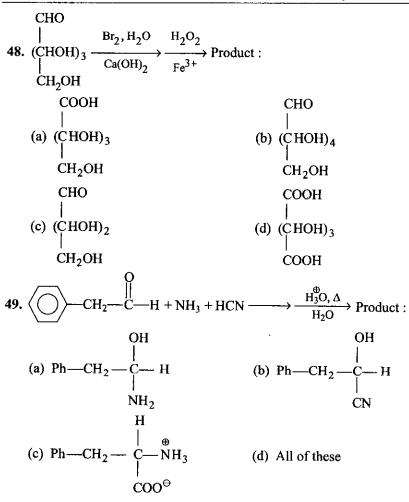
CH₂—OH

(b) —COOH group

COOH

- (c) both —NH₂ and —COOH
- (d) None of these
- **46.** Which of the following is correct structure of histidine at pH = 0?





50. Find out the structure of lactose:

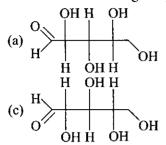
51. A tripeptide is written as Glycine-Alanine-Glycine. The correct structure of tripeptide.

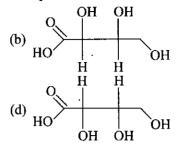
52. What would be the net charge on the given amino acid at pH = 14?

53. How many moles of HIO₄ is required to break down the given molecule here?

54. The products of HIO₄ oxidation of the following compound is:

55. Which of the following compounds is D-aldopentose:





EXERCISE-2 MORE THAN ONE CORRECT ANSWERS



1. The final product of which of the following reactions furnishes evidence that glucose has unbranched carbon chain:

(a) Glucose
$$\frac{1. \text{ Br, H}_2\text{O}}{2. \text{ Red P + HI}}$$

(b) Glucose
$$\frac{1. \text{ NaBH}_4}{2. \text{ Red P + HI}}$$

(c) Glucose
$$\xrightarrow{1. \text{ HCN}}$$
 $\xrightarrow{2. \text{ H}_3^{\oplus} \text{ O}}$ $\xrightarrow{3. \text{ Red P + HI}}$

(d) Glucose
$$\xrightarrow{\text{CH}_3\text{OH, H}^{\oplus}}$$

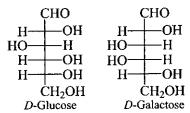
- 2. Which of the following reagents would convert an aldose into corresponding aldonic acid?
 - (a) Tollen's reagent

(b) Fehling's solution

(c) Bromine water

- (d) Red P + HI
- **3.** Which of the following statements are correct?
 - (a) Monosaccharides are optically active polyhydroxy carbonyl compounds.
 - (b) Fructose does not react with Fehling's solution because it is keto.
 - (c) α -*D*-Glucose and β -*D*-Glucose are anomers.
 - (d) *D*-Glucose and *D*-Mannose are epimers.
- **4.** Which of the following statements are correct?
 - (a) Hydrolysis of sucrose with dilute acid yields an equimolar mixture of *D*-Glucose and *D*-Fructose.
 - (b) Acidic hydrolysis of sucrose is accompained by a change in optical reaction.
 - (c) In sucrose, the glycosidic linkage is between C—1 glucose and C—2 of fructose.
 - (d) Aqueous solution of sucrose exhibits mutarotation.
- 5. Find the correct statements regarding the methyl glucosides obtained by the reaction of *D*-Glucose with methanol in presence of dry HCl gas.
 - (a) These are methyl ether of hemiacetal of glucose formed by intramolecular reaction.
 - (b) These are enantiomers.
 - (c) These are anomers.
 - (d) In one of these all the substituents are equatorial.

6. Following are the structure of D-Glucose and D-Galactose.



Which of the following statements are correct about these compounds?

- (a) They are diastereomers
- (b) Both are component of lactose
- (c) They are C—4 epimer
- (d) Both are optically active
- 7. When fructose treated with Tollen's reagent, silver mirror is formed due to reduction of Ag^{\oplus} by:
 - (a) fructose itself
 - (b) glucose formed by isomerisation
 - (c) mannose formed by isomerisation
 - (d) galactose formed by isomerisation
- 8. Which of the following do not undergo hydrolysis?
 - (a) Glucose
- (b) Fructose
- (c) Cane sugar
- (d) Maltose
- 9. Which of the following carbohydrate will give the same osazone?
 - (a) Glucose
- (b) Fructose
- (c) Cane sugar
- (d) Lactose

- 10. Which of the following are disaccharides?
 - (a) Glucose
- (b) Cane sugar (c) Maltose
- (d) Starch
- 11. On hydrolysis which of the following carbohydrate give only glucose?
 - (a) Sucrose
- (b) Lactose
- (c) Maltose
- (d) Starch
- 12. The presence of —CHO group in glucose is confirmed by its:
 - (a) reaction with PCl₅
 - (b) reaction by Na—Hg to give S-orbitol
 - (c) reaction with Fehling solution
 - (d) reaction with Tollen's reagent
- 13. Which of the following statements are correct for glucose?
 - (a) It gives positive test with Schiff's reagent
 - (b) It reacts with NaHSO3 and NH3
 - (c) Pentaacetate derivative of glucose does not react with H₂N—OH
 - (d) It gives positive test with Fehling solution.
- 14. When D-Glucose is treated with base it is converted into:
 - (a) D-Fructose

(b) D-Mannose

(c) D-Galactose

- (d) D-Arabinose
- 15. The phenomenon of mutarotation is shown by:
 - (a) glucose
- (b) fructose
- (c) cellulose
- (d) starch

- 16. Which of the following statements are correct with reference to amino acid?
 - (a) A carboxylic acid that contains an amino group.
 - (b) Amino acids are the building blocks of peptides and proteins.
 - (c) An amino acid may exist as a zwitter ion under suitable conditions.
 - (d) Amino acids are negatively charged in basic medium.
- 17. Which of the following statements are correct with reference to isoelectric point?
 - (a) It is the point at which amino acids bear no net charge.
 - (b) It corresponds to the pH at which concentration of zwitter ion is maximum.
 - (c) At isoelectric point amino acid exists as a base.
 - (d) None of the above.
- 18. Choose the neutral amino acid:

COOH

(a)
$$H_2N$$
— H

(b) H_2N — H

COOH

COOH

(c) H_2N — H

CH₂— CH_2 — $COOH$

(d) H_2N — H

CH₂— Ph

- 19. Consider the following statements about amino acids:
 - (a) the amino acids that constitute proteins are all L-amino acids.
 - (b) among the 20 amino acids that constitute proteins, glycine is the only one that does not possess chiral center.
 - (c) an important and sensitive test for the detection of L-amino acid is the ninhydrin colour test.
 - (d) HNO₂ liberates nitrous oxide from amino acid.
- 20. Globular protein is present in:
 - (a) blood
- (b) milk
- (c) eggs
- (d) cellulose
- 21. Which of the following carbohydrate are *D*-isomers?

22. Which of the following are reducing sugar?

23. Which are true?

- (a) Glucose is a disaccharide
- (b) Starch is a polysaccharide
 - (c) Glucose and fructose are not anomer
 - (d) Invert sugar consist of glucose and fructose

EXERCISE-3 LINKED COMPREHENSION TYPE

Passage-1

The isoelectric point (pl) of an amino acid is the pH of which it has no net charge. The pl of an amino acid that does not have an ionizable side chain such as alanine, is midway between its two pka values.

pha values.
O pka = 2.34
CH₃—CH—C—OH
$$pka = 9.69$$

$$pl = \frac{2.34 + 9.69}{2} = 6.02$$

(a) 3.22

If an amino acid has ionizable side chain, its pl is the average of the pka values of the similarly ionizing groups.

1. Find the pl of the following amino acids:

Pho C CH₂ CH₂ CH C OH
$$pka = 2.19$$

pho A = 4.25

(b) 6.44

(c) 7.96

(d) 5.93

2. Find the structure of the following amino acids at pH = 1:

3. What is the pl of the following amino acids?

$$pka = 8.95$$
 $pka = 10.79$
 $pka = 10.79$
 $pka = 2.18$
 $pka = 10.79$
 $pka = 10.79$

Passage-2

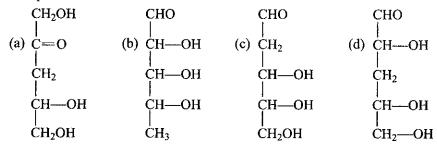
(a) 3.22

Study the Observation

Compounds	Red P + HI	Ac ₂ O/pyridine	Br ₂ +H ₂ O	ню4	Ph—NH—NH ₂
$(X) C_5 H_{10} O_5$	Isopentane	Tetraacetate	$C_5H_{10}O_6$	4 mole	No Osazone
$(Y) C_5 H_{10} O_4$	Isopentane	Triacetate	$C_5H_{10}O_5$	1 mole	Osazone formed
$(Z) C_5 H_{10} O_4$	n-pentane	Triacetate	C ₅ H ₁₀ O ₅	2 mole	Osazone formed

4. Compound '*X*' is :

5. Compound 'Z' is:



- 6. Which of the following are the reducing sugars?
 - (a) X and Y

(b) X and Z

(c) Y and Z

(d) All of these

Passage-3

D (+) Glucose has melting point 146°C and specific rotation [α]_D²⁵ is + 112°C.

Another D(+) Glucose has melting point 150°C and specific rotation $[\alpha]_D^{25}$ is +18.7°C.

The two form have significantly different optical rotation but when an aqueous solution of either form is allowed to stand, it rotation changes. The specific rotation of one form decreases and rotation of other increases until both solution show the same value +52.7°. The change in rotation towards an equilibrium value is called mutarotation.

- 7. Mutarotation is characteristic feature of:
 - (a) Epimer

(b) Enantiomer

(c) Anomer

- (d) Ring chain isomer
- 8. What percentage of β -D-(+) glucopyranose found at equilibrium in the aqueous solution?
 - (a) 50%
- (b) $\approx 100\%$
- (c) 38%
- (d) 64%

Passage-4

9. For mannose the mutarotation can be shown in brief as follow:

Protein are nitrogeneous organic compound having very high molecular mass. They are polyamide formed from α-amino acid. The bond formed between two amino acid is called peptide bond (-C-NH-). The product obtained by this peptide

bond formation are called peptide and they may be divided as di, tri, tetra, penta peptide.

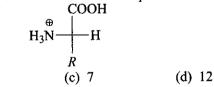
- 10. Consider following statements concerning protein.
 - 1. All amino acids which are constituents of proteins or α -amino acid.
 - 2. α -amino acids are all optically active and have L-configuration.
 - 3. An especially favourable conformation for the peptide linkage in protein is the \alpha-helix arrangement.
 - α-amino acids are connected by ester linkage.

Which of the following statement are correct?

(a) 1 and 3

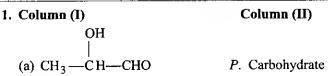
(a) 0

- (b) 1 and 2
- (c) 2 and 3
- (d) 2, 3 and 4
- 11. The given structure of amino acid will exist at which pH?



- (b) 612. Which statement are correct about peptide bond?
 - 1. —C—NH— group is planar.
 - 2. C—N bond length in protein is longer than usual bond length of C—N bond.
 - 3. C—N bond length in protein is smaller than usual bond length of C—N bond.
 - (a) 2 and 3
- (b) 1 and 2
- (c) 2 only
- (d) 1 and 3

MATRIX MATCH TYPE EXERCISE-4



- 2. Column (I)
 - (a) α-D-Glucopyranose \rightleftharpoons β-D-Glucopyranose
 - (b) Glucose

 → Mannose

 - $(d) \xrightarrow{H} OH \rightleftharpoons C -OH$ $CH_2OH HO -H$ CH_2OH
- 3. Column (I)
 - (a) Sucrose
 - (b) Cellulose
 - (c) Maltose
 - (d) Starch
- 4. Column (I)
 - (a) Glucose
 - (b) Fructose
 - (c) Mannose
 - (d) Glucopyranoside
- 5. Column (I)
 - (a) Maltose
 - (b) Sucrose
 - (c) Lactose
 - (d) Fructose
- 6. Column (I)
 - (a) Cellulose
 - (b) Protein
 - (c) Lipid
 - (d) Nucleic acid

- Q. Amino acid
- R. Positive Tollen's test
- S. Ninhydrin test

Column (II)

- P. Lobry De Bruyn Alberda van Ekenstein transformation
- Q. Mutarotation
- R. Tautomerisation
- S. Epimerisation

Column (II)

- P. 1, 2-glycosidic linkage
- Q. 1, 4-glycosidic linkage
- R. Polysaccharide
- S. Disaccharide

Column (II)

- P. Reduces Tollen's reagent
- Q. Exhibit mutarotation in mild alkaline medium
- R. Produces tetraacetate derivative on treatment with anhydride and pyridine
- S. Gets oxidised by Br2, H2O

Column (II)

- P. Invert sugar
- Q. Reducing sugar
- R. Glycosidic linkage
- S. Disaccharide

Column (II)

- P. Polymer
- Q. Nitrogen containing
- R. Stored food in human
- S. Ester

UTL		
♦	ANSWERS	♦

Exercise-1: Only One Correct Answer

Level-1								x	
l (c)	2. (b)	3, (a)	4. (b)	5. (a)	6. (d)	7. (c)	8 (a)	9. (c)	10 (b)
11. (b)	12. (c)	13 (a)	14. (a)	15. (c)	36 (a)	17. (c)	18. (a)	19. (a)	20 (c)
21. (a)	22. (c)	23. (b)	24. (d)	25 (d)	26 (b)	27. (c)	28. (b)	29. (d)	30 (b)
31. (a)	32. (d)	33 (d)	34. (c)	35. (a)	36 (d)	37 (d)	38. (c)	39 (a)	40 (b)
41 (a)	42. (a)	43. (b)	44. (c)						
Livel-2						~	nga garagi (Kaba)		
1. (b)	2. (d)	3. (a)	4. (b)	5 (c)	6. (c)	7 (a)	8. (a)	કૃ (b)	√0 (a)!
11 (ạ)	12 (c)	13. (d)	14. (b)	15. (c)	16 (d)	17 (c)	νξ (b)	J ₀ (a)	් (d)
2). (c)	22. (a)	23 (c)	24. (b)	25. (c)	26. (c)	27. (b)	29 (d)	೧೪ (b)	30 (d)
31. (b)	32. (d)	33. (b)	34. (d)	35 (c)	36. (d)	27. (a)	38 (c)	33 (d)	40. (a)
41 (d)	42. (c)	43. (c)	44. (b)	45 (c)	4€ (a)	47. (b)	48 (c)	49. (c)	50 (a)
51 (c)	52. (b)	53. (b)	54. (b)	55 (a)					

Exercise-2: More Than One Correct Answers

•	(a, b, c)	2.	(a, b, c)	3	(a, c, d)	4.	(a, b, c)	۶,	(a, c, d)	8	(a, b, c, d)
1.	(b, c)	8.	(a, b)	9.	(a, b)	10.	(b, c)	11.	(c, d)	17	(b, c, d)
13	(c, d)	14	(a, b)	15.	(a, b)	16.	(a, b, c, d)	17	(a, b)	18	(a, d)
19.	(a, b, c)	20	(a, b, c)	21.	(a, b, c, d)	2 2.	(b, c,d)	23	_(b <u>, c, d)</u>	_	

Exercise-3: Linked Comprehension Type

1	(a)	2. (c)	3. (b)	4. (c)	5. (d)	6. (d)	7. (c)	B. (d)	9 (b)	10 (a)
11	(a)	12. (d)_								

Exercise-4 : Matrix Match Type

1. (a) $\rightarrow R$;	(b) $\rightarrow P,R$;	(c) $\rightarrow Q, S$;	$(d) \rightarrow P, R$
2. (a) → Q,R;	(b) $\rightarrow P, S$;	(c) $\rightarrow P$;	$(d) \rightarrow P, R$
3. (a) → P,S;	(b) $\rightarrow Q, R$;	$(c) \rightarrow Q, S$;	$(d) \rightarrow Q, R$
4 (a) $\rightarrow P,Q,S$;	(b) $\rightarrow P,Q$;	(c) $\rightarrow P, Q, R$;	$(d) \rightarrow R$
5. (a) $\rightarrow Q, R, S$;	(b) $\rightarrow P, R, S$;	(c) $\rightarrow Q,R,S$;	(d) → Q
6. (a) → P;	(b) → P,Q;	(c) <i>⇒ R . S</i> :	$(d) \rightarrow P, Q$





Practical Organic Chemistry

EXERCISES ONLY ONE CORRECT ANSWER

1. Carbon and h with:	ydrogen in organic c	ompounds are detec	cted by heating comp	ounc
(a) FeO	(b) CaO	(c) CuO	(d) MnO	

2. Lassaigne's test is not used for the detection of:

- (a) N
- (b) S
- (c) CI
- (d) O

3. When an organic compound is present in an aqueous medium and is less soluble in any organic solvent then, it is separated by:

- (a) continuous extraction
- (b) distillation

(c) chromatography

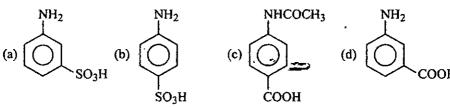
(d) sublimation

4. Ammonium molybdate is used for detection of which element in organic compound:

- (a) C
- (b) N
- (c) P
- (d) S

5. A white crystalline solid 'X' give following chemical test:

- (i) it liberates CO2 with NaHCO3
- (ii) it form a coloured dye on diazotisation and coupling with β-naphthol
- (iii) with Br₂ water it forms white precipitate of 2, 4, 6-tribromo aniline.
- 'X' can be identified as:



6. Identify the reactant 'R'

(a) (b)
$$NH_2$$
 OH OH NH_2 (c) N —OH NH_2

7. Compound 'X' give following reactions

$$X (C_6H_8O_2) \xrightarrow{\text{Na metal}} H_2 \text{ gas } \uparrow$$

$$Z_4-DNP \longrightarrow \text{Yellow orange ppt}$$

$$O_3 \longrightarrow B (C_6H_8O_4) \cup$$

Its structure can be:

8. A mixture of two organic compound gives red coloured precipitate with cuprous chloride and silver mirror on heating with Zn and NH₄Cl followed by AgNO₃ + NH₄OH solution. The mixture contains:

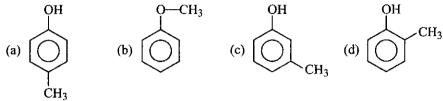
which of the following reagents will not react with above compound?

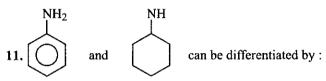
(a) Na metal

(b) $AgNO_3 + NH_4OH$

(c) Cu₂Cl₂ + NH₄OH

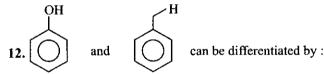
- (d) NaHCO₃
- 10. Compound 'P', C₇H₈O is insoluble in water, dilute HCl and NaHCO₃. It dissolves in dilute NaOH. When P is treated with Br₂—H₂O, it convert rapidly into a compound of formula C₇H₅OBr₃. Identify structure of:





(a) carbylamine reaction

- (b) H_2SO_4
- (c) diazotisation followed by β-naphthol (d) mustard oil reaction

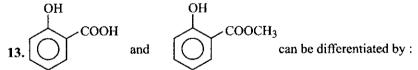


(a) FeCl₃

(b) NaOH

(c) NaNO₂ + HCl

(d) Fehling's solution

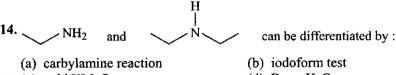


(a) NaOH

(b) Na metal

(c) NaHCO₃

(d) FeCl₃



(c) cold KMnO₄

(d) $Br_2 - H_2O$

O

(a) Tollen's reagent

(b) Fehling's solution

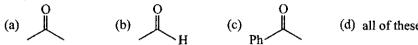
(c) Lucas reagent

(d) Victor meyer's test



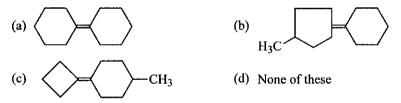


16. Compound 'X' give positive test with 2,4-DNP and with I₂/NaOH compound (X) may be:



17. An organic compound containing one oxygen gives red colour with cerric ammonium nitrate solution, decolourise alkaline KMnO₄, respond iodoform test and show geometrical isomerism. It should be:

- 18. Which of the following is true?
 - (a) Alcohol give red colour with cerric ammonium nitrate
 - (b) Aldehyde and ketone give orange red colour with 2,4-DNP
 - (c) RCOOH give CO2 with NaHCO3
 - (d) All are true
- 19. Compound (A) $C_{12}H_{20}$, discharges the colour of Br_2 — H_2O and cold KMnO₄. On reduction with H_2/Pt it gives compound (B) $C_{12}H_{22}$. A on ozonolysis give cyclohexanone. Find structure of A:



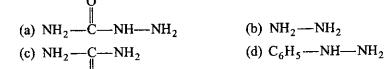
- 20. Which of the following is true?
 - (a) Tollen's reagent gives a positive test with all aldehyde
 - (b) Fehling's solution gives a positive test with all aldehyde
 - (c) Tollen's reagent gives a positive test with all carboxylic acid
 - (d) Tollen's reagent gives a positive test with α -methyl keto
- 21. A monocarboxylic acid decolourise Br₂—H₂O, on heating with soda lime derivative of styrene is formed, with neutral FeCl₃, a buff coloured precipitate is formed. Acid could be:

(a)
$$\bigcirc$$
 COOH (b) \bigcirc OH



(c)
$$OH$$
 OH OH

- 22. Which of the following compounds decolourise Br₂—H₂O and also give positive test with neutral FeCl₃:
 - (a) OH (c) OH (d) OH
- 23. Lassaigne's test for the detection of N fails in:



EXERGISE MORE THAN ONE CORRECT ANSWERS



1. Which of the following aromatic compounds will react with KMnO₄?

2. Which of the following compounds give positive test with Tollen's reagent?

(a)
$$H-C-OH$$
 (b) OH OH (c) $CH_3-CH-OC_2H_5$ (d) CH_3-C-H

3. Which of the following compounds give negative test with Tollen's reagent?

(b)
$$CH_3$$
 CC_2H_5 CC_2H_5

(c)
$$\frac{\text{CH}_3}{\text{CH}_3}$$
 C $\frac{\text{OH}}{\text{OC}_2\text{H}_2}$

- 4. Which of the following reagents cannot be used for differentiation between glucose and fructose?
 - (a) Lucas reagent

(b) Br_2-H_2O

(c) Tollen's reagent

- (d) 2,4-DNP

and CH₃CH₂OH?

(a) NaOI

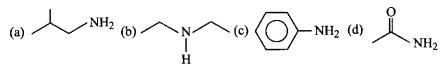
(b) Fehling's solution

(c) Tollens' reagent

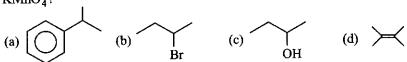
- (d) ZnCl₂/H
- 6. Which of the following compounds produce CO₂ on reaction with NaHCO₃?

7. Which of the following compounds will react with NaNH₂?

8. Which of the following compounds will give isocyanide on reaction with CHCl₂ + KOH?



9. Which of the following compounds may give reaction with acidic KMnO₄?



- 10. Which of the following reagents can be used to differentiate 1° and 3° alcohols?
 - (a) pcc
- (b) $K_2Cr_2O_2/H^{\oplus}$ (c) Jones reagent (d) Br_2-H_2O
- 11. Which of the following reagents cannot be used for differentiation between CH₃CHO and CH₃—C—Ph?
 - (a) NaOI

(b) Tollen's reagent

(c) H₂N—OH

- (d) $Ph NH NH_2$
- 12. Which of the following will not give white precipitate with ammoniacal silver nitrate solution?
 - (a) CH₃—C≡C—CH₂



(c) /

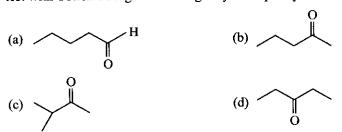
- 13. Which of the following tests can be used for differentiation among 1°, 2° and 3° alcohol?
 - (a) Lucas test

- (b) Victor meyer's test
- (d) Haloform reaction (c) Cu/300°C
- 14. Which of the following test can be used for identification of 1° amine?
 - (a) Carbylamine test

(b) Hofmann mustard oil reaction

(c) NaNO₂/HCl

- (d) Fehling's solution
- 15. Unknown compound (A) C₅H₁₀O give positive test with 2,4-DNP but negative test with Tollen's reagent. It also give yellow precipitate with I2/NaOH. (A) is:



EXERCISE-3 LINKED COMPREHENSION TYPE



Passage-1

Compound (A) C_7H_8O is insoluble in aqueous NaHCO₃ and dissolves in aqueous NaOH and gives a characteristic colour with neutral FeCl₃. When treated with Br₂ (A) forms compound (B) $C_7H_5OBr_3$.

1. The most probable structure of compound A is:

$$(a) \begin{picture}(200,10) \put(0,0){\line(0,0){100}} \put(0,0){\line(0,$$

2. The structure of compound (B) would be:

(a)
$$CBr_3$$
 Br CH_3 Br CH_2OH Br CH_3 Br CH_3 Br CH_3 Br CH_3 Br CH_3 CH_3

3. What could be the structure of compound (A) if neither dissolves in aq. NaHCO₃ nor gives a characteristic colour with FeCl₃?

(a)
$$OH$$
 OH OH CH_3 OH CH_3

Passage-2

From the following sequence of reactions,

$$[A](C_6H_{12}) \xrightarrow{HCl} (B)(C_6H_{13}Cl) + (C)(C_6H_{13}Cl)$$
 react with AgNO₃ to give white ppt.

[B]
$$\xrightarrow{\text{Alc. KOH}}$$
 (D) (An isomer of A) gives positive test with Br_2/CCl_4

$$[D] \xrightarrow{\text{Ozonolysis}} (E)$$
 gives positive iodoform test and negative

Fehling's test.

 $[A] \xrightarrow{\text{Ozonolysis}} (F) + (G)$, both F and G give positive Tollen's test.

$$[F]+[G] \xrightarrow{\text{Conc. NaOH}} \text{HCOONa} + \text{alcohol}$$

4. The structure A and B respectively are:





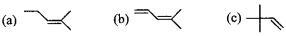




5. The structure of *C* is :

(a)
$$+$$
 (b) Cl (c) $+$ (d) $+$

6. The structure of compound D is :





- 7. The reaction involve in the F and G with the NaOH is:
 - (a) Reimer-Tiemann reaction
- (b) Aldol condensation

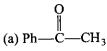
(c) Cannizzaro reaction

(d) Perkin reaction

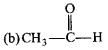
RCISE-4 MATRIX MATCH TYPE













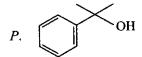
(d) CH₂CH₂OH

- Column (II)
- P. Aldol condensation
- Q. Positive iodoform test
- R. Negative test of Fehling's solution
- S. Oxidation with Cu/Δ

2. Column (I)

(a) NaHCO₃

Column (II)



(b) Na metal

Q. CH_3 $C \equiv CH$

(c) 2,4,-Dinitrophenyl hydrazine

R. H COOH

(d) Lucas reagent

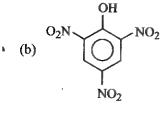
S. H₃CO OH OH

3. Column (I)

Column (II)



P. Decolourise Br₂ water



- Q. Effervescence of CO₂ on reaction with NaHCO₃
- (c) CH₂-CH=CH₂
- R. Oxidation with alkaline KMnO₄

- (d) OH
- S. React with Na metal

4. Column (I)

. Column (II)

(a) CH₃ —C≡CH O ∥

- P. Positive test with Fehling's solution
- Q. Positive test with Tollen's reagent



R. Decolourise Br₂—H₂O

(d)
$$H-C$$
 NH_2

S. Isocyanide test

5. Column (I)

(a) H_3C — CHO + 2,4-DNP

$$\begin{array}{c}
O \\
\parallel \\
\text{(b) Ph} --C --CH_3 + I_2 / OH
\end{array}$$

Q. Orange

P. Yellow

(c)
$$\rightarrow$$
 NO₂ + HNO₂
OH

R. Violet

S. Blue

6. Column (I)

- (a) Presence of halogen
- (b) Presence of sulphur
- (c) Presence of nitrogen
- (d) Presence of N and S

Column (II)

- P. HNO₃/AgNO₃
- Q. Na₂[Fe(CN)₅NO]
- $R. Co(NO_3)_2$
- S. FeCl₃

 $(d) \rightarrow Q, S$

♦

ANSWERS



Exercise-1: Only One Correct Answer

1. (c) 2. (d) 3. (a) 4. (c) 5. (b) 6. (a) 7. (c) 8. (a) 9. (d) 10. (c)

11. (c) 12. (a) 13. (c) 14. (a) 15. (b) 16. (d) 17. (b) 18. (d) 19. (a) 20. (a)

21. (d) 22. (c) 23. (b)

Exercise-2: More Than One Correct Answers

2. (a, b, c, d) 3. (b, c, d) 1. (a, b, c) (a, c) 5. 4. (a, b) 6. (a, c, d)

7. (a, b, c, d) 8. 9. (a, c, d) 10: (a, b, c) 11. (a, c, d) 12. (a, b, c) (ã, c)

13. (a, b, c) 14. (a, b, c) 15. (b, c)

Exercise-3: Linked Comprehension Type

1. (b) 2. (b) 3. (a) **6**. (d) 4. (a) 5. (c) 7. (c)

Exercise-4: Matrix Match Type

1. (a) $\rightarrow P, Q, R$; (b) \rightarrow P, Q; (c) $\rightarrow R$; \cdot (d) \rightarrow Q, S

 (a) → R; (b) $\rightarrow P, Q, R, S$; (c) $\rightarrow Q, R$; $(d) \rightarrow P$

3. (a) \rightarrow Q, S; (b) $\rightarrow Q$; (c) $\rightarrow P, R$; $(d) \rightarrow P, Q, R, S$

 (a) → Q, R; (b) $\rightarrow P$, Q;

(c) \rightarrow S;

5. (a) \rightarrow Q; (b) $\rightarrow P$; (c) \rightarrow S; $(d) \rightarrow R$

 ϵ . (a) $\rightarrow P$; (b) → Q; (c) <u>→ S:</u> $(d) \rightarrow R$



Nomenclature

SECTION!

Give IUPAC name for each of the following:

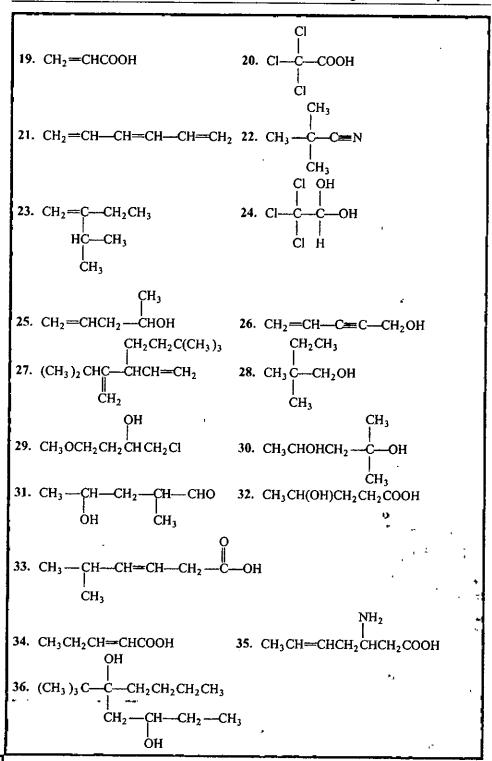
QCH₃

OH

14. (CH₃)₂ CHCCH₂COOCH₃

12. CH=CCH₂CN

CH₂CHO



55.
$$AsH_2$$

54. SHC
$$\stackrel{4}{\cancel{\bigcirc}}$$
 $\stackrel{1}{\cancel{\bigcirc}}$ COOH

56.
$$Cl \xrightarrow{5} \frac{6}{2} \frac{COOH}{CH_2-OH} Cl O CH_2-CH-CH_2-CH-CH_3$$

57.
$$4'' \underbrace{ \begin{bmatrix} 5'' & 6'' \\ 3'' & 2'' \end{bmatrix}_{1''4'} \begin{bmatrix} 5' & 6' \\ 3' & 2' \end{bmatrix}_{1'1} \underbrace{ \begin{bmatrix} 2 & 3 \\ 6 & 5 \end{bmatrix}}_{4} 4$$

59. HOOC—
$$H_2$$
C— G CH₂—COOH
$$G$$
CH₂—COOH
$$G$$
CH₂—COOH
$$G$$
CH₂—COOH

61.
$$OHC \xrightarrow{4} {}^{3}CH_{2} \xrightarrow{2} {}^{2}CH_{2} \xrightarrow{1} COOH$$
 62. $H_{3}C \xrightarrow{4} {}^{3}C \xrightarrow{2} CH \xrightarrow{1} COOH$

9.
$$CH_3$$
 CH_3 CH_3 CH_3

75.
$$CH_3$$
— CH = C — CH_2COOH
 CH_3

78.
$$C_6H_5CH=C(CH_3)_2$$

87.
$$(C_2H_5O)_2Zn$$

90.
$$(C_2H_5)_3B$$

SECTION-II

Write down structure of the following compounds:

- 1. 1,2-dibromo-3-chloro-1-propene
- 3. 2-butenamide
- 5. 2-chloromethoxyethanol
- · 7. 1,3-dichloro-2-propanol
 - 9. 3-methyl-2-butenoic acid
 - 11. 3-chloro-3-methyl-1-butyne
- 13. 2-ethyl-3-bydroxyhexanal
- 15. 2-methyl-2-butene
- 17. 4-methoxy-2-butenoic acid
- 19. 2-propen-1-ol

- 2. 2-ethoxy-1-ethanol
- 4. 2-aminopropanoic acid
- 6. 3-bromo-1-propene
- **8.** 3-buten-2-ol
- 10. 4-dimethylamino-2-butanol
- 12. 2-methyl-2-pentenal
- 14. 4-methyl-2-pentene
- 16. 3-ethyl-1,3-hexanediol
- 18. 1,5-hexadiene
- 20. 2,2,2-trichloroethanoic acid

21.	2-chloro-1,3-butadiene		
	2-methyl-2-propene-1,1-dicarboxylic	e acid	đ
	2-methyl-2-butenoic acid		3-bromo-2-methylpentan-2-ol
	3-methylbut-3-en-1-ol		pentane-2,4-dione
	1-ethoxypropan-1-ol	28.	6-hydroxy-3,5-dimethyloct-4-enal
	5-bromopent-3-en-2-one		4-cyano-4-ethylpentan-3-one
	2-chloroĥex-5-ynal	32.	2-methylbutane
	2,2,4-trimethylpentane	34.	3-methylpentane
35.	4-ethylheptane	36.	5-ethyl-2,2-dimethylheptane
37.	3-methylpentane		
38.	4-tert-butyl-2-methylheptane or 4-(1	,1-di	methylethyl)-2-methylheptane
39.	4-ethyl-3-methylheptane		
40.	4-isopropylheptane or 4-(1-methylet	hyl)	heptane
41.	2,3-dimethylpentane		2-ethyl-1-hexene
	2-methylpropene		2-ethyl-3-methyl-1-butene
	2-methylpropane		2,2,4-trimethylpentane
	3,3,5-trimethylheptane		3,3-dimethyl-1-butene
	2,4-dimethyl-2-pentene	50.	2-methyl-3-hexyne
	1,2,3-trichlorobutane		1,2-dibromo-3-chlorobutane
	1-bromo-2,2-dimethylpropane		2-methyl-2-propanol
	1-phenyl-2-propanol		1-phenyl-1-propanol
	3-ethyl-3,7,7-trimethyl-2-octanol		2-phenylethanol
	Propanal		3-cyclopropyl-3-methylbutanal
	3-methyl-2-butanone		3-methylbutanal
	3-methylbutanoic acid	64.	4-methyl-2-pentanone
	Ethyl propanoate		N,N-diethylpropanamide
	3-methoxypentane		1-ethoxypropane Propanoic anhydride
	3-methylpentanoic acid	70.	Propanoic annyuride
	N-ethylethanamide Isopropyl propanoate or 1-methyleth	ngt m	ronanoate
	N-methylpropanamide	191 (D) 74	2-methyl-3-phenylpentanoic acid
	3-chloro-1-butanol		4-chloro-2-pentyne
	3-(1-chloroethyl)-4-methyl-4-pheny		
	3-chloro-4-methyl-3-hexene	79	3-bromo-1-propyne
	2-ethyl-3-oxobutanal		2-butenoic acid
	2-oxobutanoic acid		Methylaminoethanoic acid
	Bromopropanone		1-chloro-2-propanol
	1,2-dimethoxyethane		4-methoxy-2-methyl-2-butanol
	3-penten-1-ol		4-methyl-3-penten-2-one
	3,5-hexadienoic acid		1,1-dichloro-2-methylpropene
	2-hydroxybutanoic acid		1-chloro-5-methyl-2-hexanone
	3-bromo-1,3,5-hexatriene	95.	3,3-dimethyl-1-penten-4-yne
	1-bromo-3-methoxypropane	97.	1,4-dibromo-1-butyne
	Methoxypropanone	99.	3-bromo-N-ethylbutanamide
	3-methoxy-2-pentanol		4-chloro-2-ethyl-1-butene
	1-penten-3-one		4-methyl-3-pentenal
			5-bromo-3-hexanol
	P		Butenedioic acid
	2-butyne-1,4-diol	109.	2-methylpropanedioic acid

- 110. 1-ethyl-1-methylcyclohexane
- 111. 1-isopropyl-3-methylcyclohexane
- 112. 1-cyclobutyl-3-methylpentane
- 113. Methyl 3-bromo-2-hydroxy-2-methylbutanoate
- 114. 5-oxopentanoic acid
- 115. N, 3,3-trimethyl-1-butanamine
- 116. 4-chloro-2-methylpentanenitrile

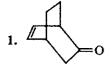
SECTION-III

Write down the bond line structure of the following:

- 1. Bicyclo [3, 1, 0] hexane
- 3. 4-bromo-9-methyltricyclo [5.3.0.0^{2.6}] decane
- 4. Cyclododecane
- 6. 1-pentane nitrile or 1-pentanonitrile
- 8. Propanalimine
- 10. 3-methyl-2-butanol
- 12. 2,4-hex-di-yne
- 14. 1-hexyne
- 16. 3-methyl-1-cyclohexene
- 18. Cis- (or Z-) 2-butene
- 20. 2-methyl-2-cyclopropylpropane
- 22. Trans-1,2-dimethylcyclohexane
- 24. Cis-1,2-dimethylcyclobutane
- 26. 5-ethyl-3-methyl-4-isopropyl nonane
- 27. 2,2-dimethylbutane
- 29. n-pentane

- 2. 8-chlorobicyclo [4. 2.0] oct-2-ene
- Ethyl butanoate
- 7. 2-methoxy-2-methyl-propane
- 9. N.N-dimethyl-ethanamide
- 11. N-ethyl-N-methyl-2-aminopropane
- 13. 2-heptyne
- 15. 3-methyl-1-pentene
- 17. Cis-(or Z-) 3-hexene
- 19. Trans- (or E-) 2-butene
- 21. 4-tert-butyl heptane
- 23. Trans-1,3-dimethylcyclobutane
- 25. Cis-1-methyl-3-isopropylcyclohexane
- 28. 2-cyclohexylbutane

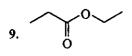
Write down the IUPAC name of the following:













Section-

HINTS AND SOLUTIONS

- ?. 2-cyanoethanoic acid
- 3. 1-chloro-2-propanol
- 5. 3-methoxybutanal
- 7. Bromopropanone
- 9. 4-hydroxybutanoic acid
- 11. 3-hydroxypentanedioic acid
- 13. 2-(2-chloroethyl)-1-pentene
- 15 5-hexen-2-one

- 2. 3-chloro-2-butanone
- 4. 2-bromobutanoic acid
- 6, 1,3-pentadiene
- 8. 1,4-butanediol
- 10. Methyl, 3-bromobutanoate
- 12. 3-butynenitrile
- 14. Methyl, 4-methyl-3-oxopentanoate
- 16. 6-amino-3-heptanol



١	2-butenal	• (3-chloro-3-methylbutanal
•	Propenoic acid		2,2,2-trichloroethanoic acid
٠.	1,3,5-hexatriene	<i>:.</i>	2,2-dimethylpropanenitrile
33	2-ethyl-3-methyl-1-butene	•	2,2,2-trichloro-1,1-ethanediol
· 3.	4-penten-2-ol		4-penten-2-yn-1-ol
	A : 10/00 ** * ** ** * * * * * * * * * * * *	tadien	
٠	2,2-dimethyl-1-butanol		1-chloro-4-methoxy-2-butanol
, š	2-methyl-2,4-pentanediol		4-hydroxy-2-methylpentanal
	4-hydroxypentanoic acid	,	5-methyl-3-hexenoic acid
31.	2-pentenoic acid		3-amino-5-heptenoic acid
٠.	C 1 . 1 . C	*	3-(1-hydroxyethyl)-5-methylheptanal
	4-bromo-2-ethylcyclopentanone	٠,	6-bromo-2-oxocyclohexanecarbaldehyde
	3-cyclohexene-1,2-dicarboxylic acid		Cyclobutylethanoic acid
.:.			-,
•	Methyl, 3-bromo-2-hydroxy-2-methylbuta	noate	
٠.	3-amino-2-sec-butyl-5-cyclohexen-1-ol	mouro	
15	3-carboxy-3-hydroxypentanedicarboxylic	acid	
Α,	2-methyl-5-hexen-3-ynoic acid		1-chloro-2,3-butanediol
ĵĵ,	Butenedioic acid		
٠.	Diethylbutanedioate		4-chloro-6-methyl-3,5-heptadien-2-one
	1-chloro-1-propene		Cyclohexylidenemethanone
Ä.	4-(thioformyl) benzoic acid		Cyclohexylarsane
,	4,5-dichloro-2-[4-chloro-2-hydroxymethyl	-5-0v	pheryil cycloherane. Learborylic acid
٠,	1,1': 4', 1" Terphenyl	J OAL	menyi; eyelellekulle-i-earooxyile acid
		cid	
·	Benzene-1,3,5-triacetic acid		Bicyclo [4.2.0] octane
	4-oxobutanoic acid or 3-formylpropanoic a	acid	Dieyero (1.2.0) counte
~	3-methoxycarbonyl but-2-en-1-oic acid	/?	3-oxobutanoic acid
٧.	2-amino-3-hydroxy-4-oxopentanoic acid		2 CACCULATION WOLL
	N-methyl-2-(2'-chloroethyl)-3-oxo-pent-4-	en-1-a	mide
1	1-(1-methylethyl)-2-(1,1-dimethylethyl) cy		
	1-tert-butyl-2-isopropylcyclopentane	olopo	
(1-methyl-2-(2-methylpropyl) cyclohexane	or 1-is	sobutyl-2-methylcyclohexane
•	Butylcyclohexane	0	1-chloro-2,4-dimethylcyclohexane
٠. ,	2-chlorocyclopentanol	÷	Pot3-methyl pentanoate
	2-bromo-3-chloro-3-methylbutanoic acid	*	2-phenyi-2-butene
	2,4-dimethyl-1,6-hexanediol		3-methyl-3-pentenoic acid
	Methyl-p-chloro benzoate	٠. ر	
;	2-methyl-1-phenyi-1-propene	•	4-hydroxy-4-methyl-2-pentanone
	Methyl-2-methyl-2-propenoate		3-hydroxy-2-methyl pentanal
	2-methyl-3-phenyl-2-propenal		3-hydroxy-2,2-dimethyl propenal
	1,3-diphenyl-2-propen-1-one		2,3-diphenyl-2-propenal
	4-phenyl-3-buten-2-one		Zinc ethoxide
	Al-tert butoxide		Tetramethyl silane
	Triethyl borane		2-ethyl oxirane or 1,2-epoxybutane
	2,2-dimethyl oxirane		2,3-dimethyl oxirane
	2,3-epoxy-1-propanol		1,2-epoxy-1-propanol
*	2-methyl-2-butene		Ethyl isopropyl ether
	1-bromo-3-pentanone		2,2,3-trimethyl-I-pentanol
	Ethanoyl chloride		4-pentyn-1-ol
	1,2,3-propanetriol		2,3-dimethyl-2-butene
			-,

144. 2,4,4-trimethyl-2-pentene

11.4. 4-hydroxy-2-pentenoic acid

+108. 2,3-pentadienc

11th. 1,1,2-trichloroethane

1112. 2-chloro-1,3-butadiene

111. N-phenylethanamide

105. 2,3-pentanedione

107. 3-chloropropanal

109. 1,5-heptadien-3-yne

111. 2-chloropropanoic acid

113. 4-methyl-3-penten-1-ol115. N,3,3-trimethylbutanamide

Section-II

CI

 C_2H_5

OH

 $CH_3CH_2C = CCHCH_3$ $(CH_3)_2C \rightarrow CHCH(CH_3)_2$ CH₃ . CH2Br---CHCl---CH3 CH₂Cl—CHCl—CHCl—CH₃ CH_3 CH_3 CH3---C---OH CH₃---C---CH₂Br CH₃ C₆H₅—CHCH₂CH₃ C₄H₃CH₂CHCH₃ ÒΗ CH₃ CH₂CH₃ CH₃CCH₂CH₂CH₂CCH₃ C₆H₅CH₂CH₂OH СН3 СН3---СНОН CH_3 ← CH₃—C—CH₂—CHO CH3CH2CHO CH₃ CHCH₂CHO CH₃ CH₃CHCH₂COOH -CH₂ÇHCH₃ CH_3 ĊH₃ NCH2CH3 -OCH₂CH₃ CH₂CH₃ CH3CH2CH2OCH2CH3 CH₃CH₂CHCH₂CH₃ OCH₃ CH3CH2CO-O-CO-CH2CH3 CH3CHCH2COOH -O---ÇHCH₃ -NH--CH₂CH₃ CH₃ C₆H₅

CH₂CH₃

:@3. CH₃—C=CHCH₂CHO CH₃

°S. CH3CH2CHCH2CHCH3

107. СООН—СН=СН—СООН

исэ. сн₃снсоон соон

iii. 🔷

113. CH₃CH—C—C—OCH₃

CH₃

115. (CH₃)₃CCH₂CH₂NHCH₃

Sو<u>تون</u>: -ااا

1.

3. — Br

7. O

8. \\\\

11.

104. CH₃—CHCH₂CHCH₂COOH NH₂ CH₃

105. CH2=CH-C≡N

108. HO--CH2C=C--CH2OH

He.

112.

114. OCH(CH₂)₃COOH

116. CH₃CHCH₂CHCH₃ CN Cl

2.

* -

ń. ______c _____

S. Nr

IO. OH

12. ====

13.

15.

17.

19.

21.

23.

25.

27,

29.

14.

16.

18.

20.

22.

24.

26.

28.

Section-IV

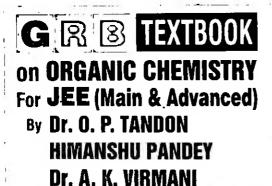
- 1. Bicyclo [2.2.2] oct-5-en-2-one
- 3. Bicyclo [3.2.1.] octane
- 5. Bicyclo [4, 2, 0] octane
- 7. Cis-1-bromo-2-chlorocyclobutane
- Methyl propanoate
- 11. 4-methylpentanal
- 13. Octa-1-ene-4-yne
- 15 1,5-octadiyne
- 17. 2-(1-cyclobutenyl)-1-hexene
- 19. 3-ethyl-1-octene
- 21. Cis-1-t-butyl-3-methylcyclopentane
- 23. Trans-1,2-diethylcycloheptane
- 25. Trans-1,4-dimethyl cyclohexane

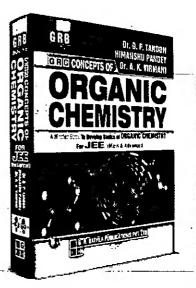
- 2. Bicyclo [2.2.1] heptane
- 4. Spiro [5, 4] decane
- 6. Trans-1,3-dichlorocyclopentane
- & Ethyl-2-bromopropanoate
- 10. 2-chloropropanoic acid
- 12. 3-pentanone
- 14. 2-methyl-3-hexyne
- 16. 1,3-pentadiene
- 18. 2-isobutyl-1-heptene
- 20. 2-cyclopropyl-1-hexene
- 22. 4-isopropyl-2-octene
- 24. 5-s-butylnonane
- 26. Cis-1,2-dimethylcyclopentane

		NO	ES			
	l an yel kiliman ilikilisan jarahasi maniyela ili ili malaha		. spráwnagos dip chállim schick	Es um supers a publicado e es de este de mais despois	eranyaadu ayar Jung grup nabar	ود ووسله و دور د د ا ر دور و دور
	······································			*		
and the figure of the contraction of the contractio	- p - y (p pour up or y y y pop per per per per per per per per per pe	eis (Terre, Aldrich (Terres) (1984) (1984) (1984) (1984) (1984) (1984) (1984) (1984) (1984) (1984) (1984) (1984)				an entraphenous brings
. 40 g water a stranger terrange depter of the contract of the	ones of the second contract of the second of		**************************************			1-00, 10-11-0 x 10-00,00-0
And the stand and the property of the standard	ton with a divide the down's apply per debut the study of		.p.,			
incomplete reasonable and a second decision of the second second	nia Krimi madijinganiyinda satabaya	and parts of the state of the s	<u></u>	remaining province Manager 10, 1 a		4
To managementaling out of a radium of remodificate before	entransfer makes improveded and an electronic designation	ng nghệ giện bư thực thay n	and a second section of the second section of	, as government as on Nove-	-	-
		,				
k. a. ungan ppand punnya ng ngan mpandagan in fisikah ng manan-	Carlo	and development and the state of the state o				
nemarks of the Constitution of the Constitutio	Louis Const. In Transport, an Experience			an merenda Santelperson		A Barettanarkeyrutus ayrusar
the state of the s	ne primario della majori dell'anti nel selli fine	September and the second secon	Capter Moder Capter		walan a water to the second	e to profile stancester of second super-
Maryangan to all your shaper samp adaptive for the		Adams	-	at whomas descriptions of	مناب وسادوهم است	
watered with ancies, watering and a watered and subject of the	فيتر وميون المنصوب المناور وميون المناورة				pow powied publicacy and appearing the	galani agailean dan abasagi
macht magazi a cop at resembracionare).	see of the contract of the contract of	and the state of t	mily of the state	agen de lagalegament de la company	a se, ma managament es	andressa programations
		E 21				,
Lading Baser angegein nergitrepin phanesthere are neuen for all	- year making and making the spiling on a subject to the spiling of the spiling o		***************************************			
nan pampangang ni nang ng pambang ng Pangapal nagkupina da d		opportunities or a sector of the	more recommendation of the second	alfa nya nga mpala sa dakkangang berbad	i	arkens versakunder ei te
ngar Adi ang sayanan ngang panangan maga rangan magangan			THE PERSON NAMED OF THE PERSON NAMED IN COLUMN	igen paracas consum noministra	ato pagalanda ana di atangga Perandi Long	
to secure a man frequency many topic (Str. sympletic many const.)	magaire on about called the set where being	managa	want of the same of the same			
- contrast contrast de contras	and the page to the first the same of the	bilongambers of montplets and			ari man sa magana aga da sa	
and a superior was true superior or the superior		miragentra i Jako gratur i kristorsk		and the state of t		L. paraminer solusidor ma
		er fil sky s pel pomilika om sky sky sky sky sky s	papaanaga salah perafik oran	ig into a submitted property and a submitted pro-	nga kaballan kada u. Mandalo wa () Tumu	gan, sames yanganin ang
Sugger and Spaces introducing a sense, Algorithesia in		and the second s				

E







GRB PROBLEM BOOKS

For JEE (Main & Advanced)

& All Other Engineering Entrance Examinations

